CQ

FEBRUARY, 1948

The Radio Amateurs' Journal

35¢

THIS MONTH

Something New in Beams — The Cobweb

A Modern Receiver for the Beginner

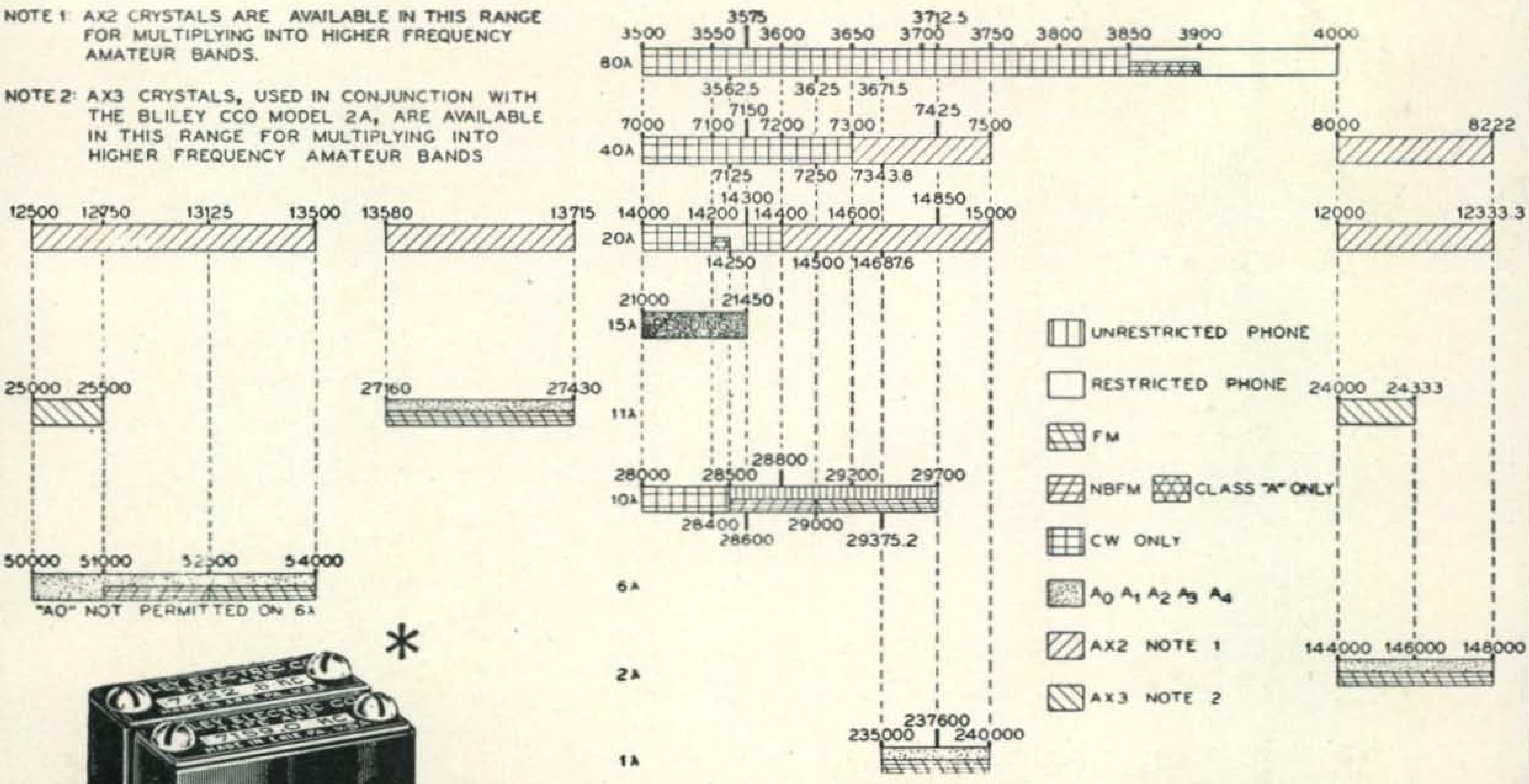
Simple Transceiver for 1250 Mc

Announcing the CQ Annual Club Awards

Published by RADIO MAGAZINES, INC. Subscription $2.50 a year

"why plug in a promise?"

AMATEUR FREQUENCY CHART



*

"plug in a BLILEY... TO BE SURE"

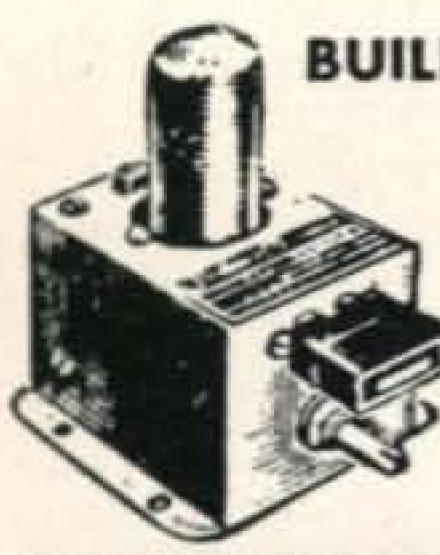
Crystal quality goes much deeper than the frequency on the nameplate. Here at Bliley we practice and preach quality control all the way from the raw quartz.

Extra care is taken to insure accuracy of calibration. Frequency stability is maintained by precise orientation of the quartz plate. Every crystal must meet a high standard of activity before acceptance. All crystals are plated to insure long term dependability and trouble-free service.

By any comparison Bliley crystals are a "techniquality" product. For further details get a copy of Bulletin 35 from your distributor.

***2 BLILEY TYPE AX2 CRYSTALS WILL FIT ANY OCTAL SOCKET**

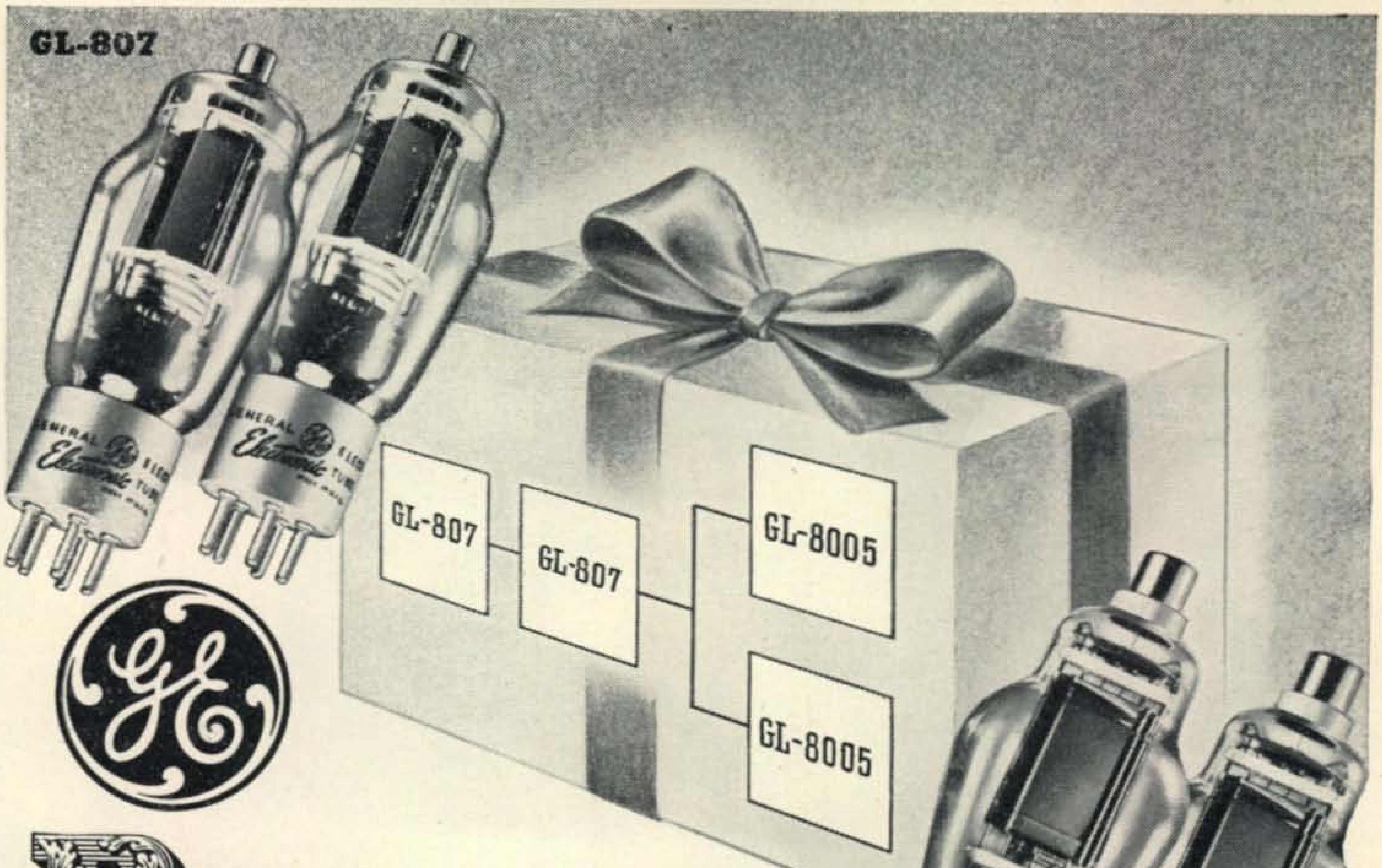
Bliley CRYSTALS



BUILD YOUR TRANSMITTER AROUND A BLILEY CCO-2A

A completely packaged crystal controlled oscillator for the 2-6-10-11 meter bands. An ideal nucleus for new construction or conversion of existing equipment. See Bulletin 34.

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA



PLUS PACKAGE
for value-seeking hams

600-w input CW! 480 w phone! . . . An economical 3-stage power line-up that will cover all 5 major low-frequency bands (80, 40, 20, 15, and 10-meter).

Here's a quartet of tubes from G.E.'s big line that sings a sweet song of watts-per-dollar value and topnotch performance. One GL-807 is employed as a Tri-tet oscillator, while the second acts as a buffer or doubler with more than ample output to drive the push-pull GL-8005 final.

Add up the cost of these four tubes and you arrive at a sum not much greater than the price of one ½-kw power triode or tetrode. And because the final is push-pull instead of a single tube, your circuit and layout are better balanced; also, second-harmonic radiation is reduced, meeting a primary need in today's ham broadcasting.

Though a simple 3-step amplification, the choice of tubes is such that no overtaxing occurs at any stage. Performance is all you could want—the 600-w max CW input (ICAS) gives a real healthy signal, while coil changing allows operation from 80 to 10 meters, *using only 80 and 40-meter crystals.*

Ask your G-E tube distributor for prices of the GL-807 and GL-8005, also for a copy of the complete circuit design for this ham PLUS PACKAGE. It's the value story of the month; purse and performance-wise you will profit by getting the facts. *Electronics Department, General Electric Company, Schenectady 5, New York.*

Speaking of circuits . . . have you read the Jan.-Feb. special Circuit Issue of Ham News? Tells you how to apply all the popular ham tubes. Don't miss this scientific rig-builder's guide. See your G-E tube distributor for your copy!

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

GENERAL ELECTRIC

161-GA2-8850

CQ
The Radio Amateurs' Journal

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Vol. 4 FEBRUARY 1948 No. 2

In This Issue

COVER—W1NZS, Brother Nilus, F.M.S. of Central Catholic High School of Lawrence, Mass., and pilot Waldo Holcombe, of North Andover, Mass., making final checks before taking off to continue the fire watch maintained by the Merrimack Valley Amateur Radio Club during the recent disastrous New England forest fires. For additional details of the club's outstanding public service to the community, turn to page 47.

Model SX·43

"The hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

One stage of high gain tuned RF and a type 7F8 dual triode converter assure an exceptionally good signal-to-noise ratio. Image ratio on the AM channel on band 5 (44 to 55 Mc.) is excellent as the receiver is used as a double superheterodyne. The new Hallicrafters dual IF transformers provide a 455 kilocycle IF channel for operating frequencies below 44 megacycles and a 10.7 megacycle IF channel for the VHF bands. Two IF stages are used on the four lower bands and a third stage is added above 44 megacycles. Switching of IF frequencies is automatic. The separate electrical bandspread dial is calibrated for the amateur 3.5, 7, 14, and 28 megacycle bands.

Every important feature for excellent communications receiver performance is included in the SX-43.


the hallicrafters co.
$169.50

• • • Letters • • •

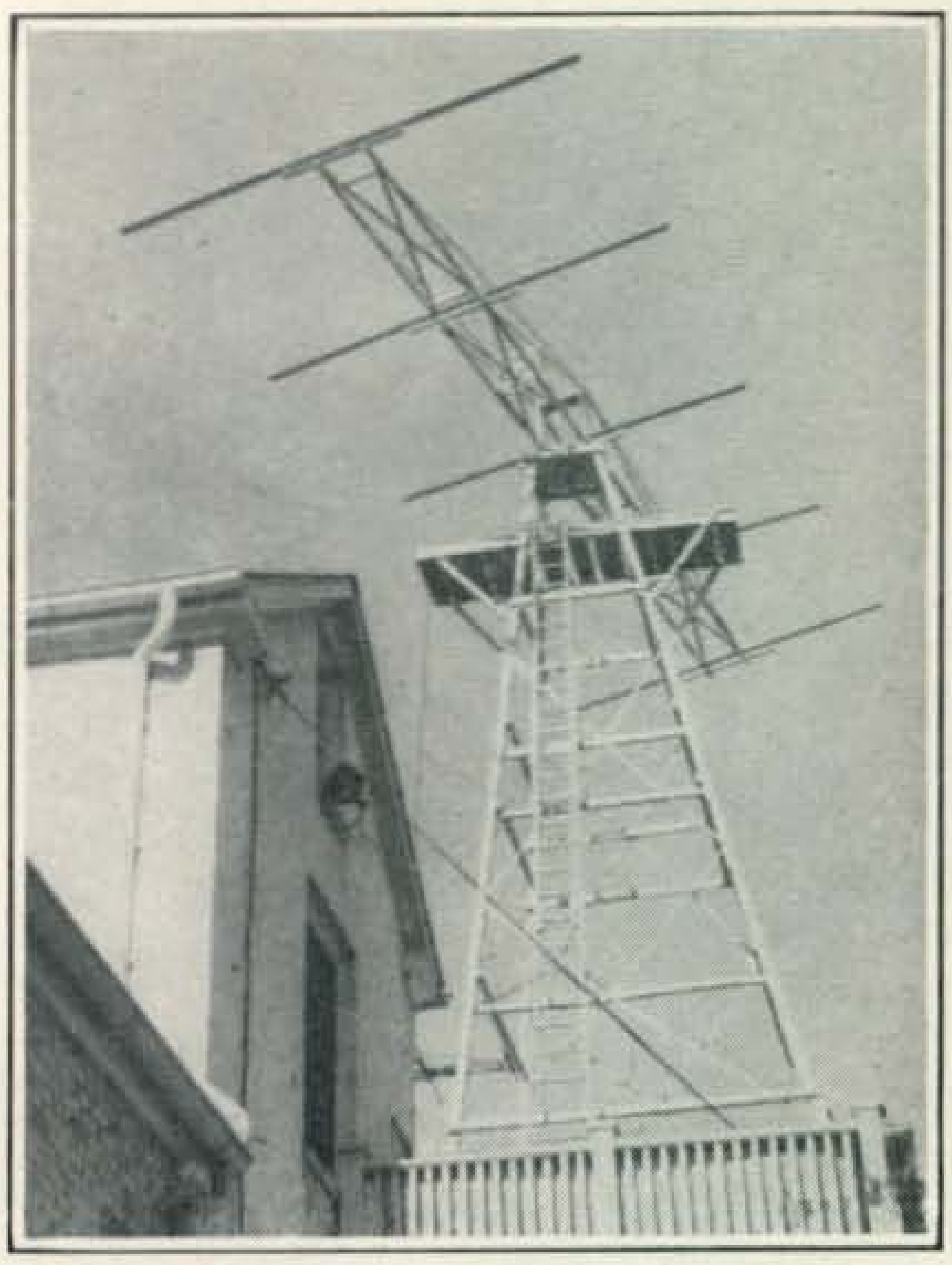
"Quarter-Wave vs. Close-Spaced Beams"

Williamsburg, Ky.

Editor, *CQ*:

Here is a snapshot of my 10-meter beam. Since it is a copy of Don Whittemore's beam described in the Feb., 1946, issue of *CQ*, I thought it might be of interest to you.

J. B. Gatliff, Jr., W4JML



Any Pineapples Today?

RFD No. 3, River Rd., Bethesda, Md

Editor, *CQ*:

Probably Jim O'Brien ("Letters," *CQ*, Nov., 1947) has heard of this "pineapple" but it may be new to some readers. Although in this case visual was employed, the procedure is essentially the same as with radio.

While standing in to port after an extended cruise an admiral had a message sent by visual requesting that his laundress be on the pier when he arrived to pick up his soiled linen. Due to several necessary relays, the shore operator received a more than slightly garbled version: "ASK ADMIRALS WOMAN TO BE ON PIER AT 1400." He sensibly requested verification and went off watch. Thirty minutes later his relief received the following startling dispatch: "PLEASE INSERT WASHER BETWEEN ADMIRAL AND WOMAN."

G. L. Countryman, W3HH

Love Thy Neighbor

Winterset, Iowa

Editor, *CQ*:

I just received notice of my failure in the code proficiency test which I took last month. I am not crying over spilled milk, but would like to get a few things off my chest.

I am capable of copying code at 35 w.p.m., but not under the conditions that came up on the test night. To begin with I started copying W1AW on 3.5 mc. When QRN got bad I shifted to 7 mc. Everything was going along nicely until some fellow amateurs had to start QRMing W1AW. When 14 mc was

tried I could hardly hear W1AW for all the QRM.

Personally, I think W1AW is doing an FB job for the amateurs. It is my belief that all fellow amateurs should have some consideration for what the fellows at W1AW are doing and try to keep off of their frequencies when QST messages are being transmitted.

Delmar Bogenrief, WØVHM

That Question Again

35 Hillview Ave., Rensselaer, N. Y.

Editor, *CQ*:

I am seventeen years old and I became a ham on September 26, 1947. For over a year I have put in hours of time in an effort to learn the code and September 26th ended my long struggle. I, too, had the same idea as Mr. Devaney, that code was not really necessary, but what can you do about the regulations?

Anyone who doesn't want to learn the code isn't wanted in ham radio. That kind of guy is just lazy and can't think up a logical reason against it anyway. He makes reference to the fact that a hundred watts of code will get through when a megawatt of phone won't as being picayune. Who cares whether or not it does or not, for it still shows he's lazy? If he doesn't want to pound brass like the rest of us do, and have done, the least he can do is learn the code, get his three QSOs and then work all the . . . phone he wants for a year and then pass his Class A. We'll all think more of him if he does.

A month or two at the code, spending about a half hour a night at it, should put Mr. Devaney on the air and change his mind about the code requirement. It did for me and you couldn't pry me from the 80-meter c-w band, except with some coils and crystals for the 40, 20 and 10 meter c-w bands. Hi!

Henry L. Schultz, Jr., W2WIK

Enforcing Band Subdivisions

Fort Collins, Colo.

Editor, *CQ:*

The many letters regarding phone QRM in the 14-mc c-w band strike a soft spot here, also. This station (as most of the c-w stations today) is running from 350 to 600 watts exclusively on 20-meter c.w., but what good is high power when QRM from the South and Central American phones splatter and buzz all over 14-mc c.w.?

I was rather peeved with a Costa Rican station that parked in the c-w band and proceeded to work W phones. For one thing, why don't the W phones play square with us c-w men and refuse to work the stations that are in the c-w band?

F. R. Olsen, W7JHQ/Ø

The Traffic Man's Column

Lake City, Fla.

Editor, *CQ*:

Believe traffic column urgently needed to expedite this portion of our hobby. The men are often handicapped by lack of knowledge of the activities outside or adjacent to their own region. Exchange of ideas on organization, operation and frequencies used would be mutually helpful.

A. G. Snow, Jr., W4IQV

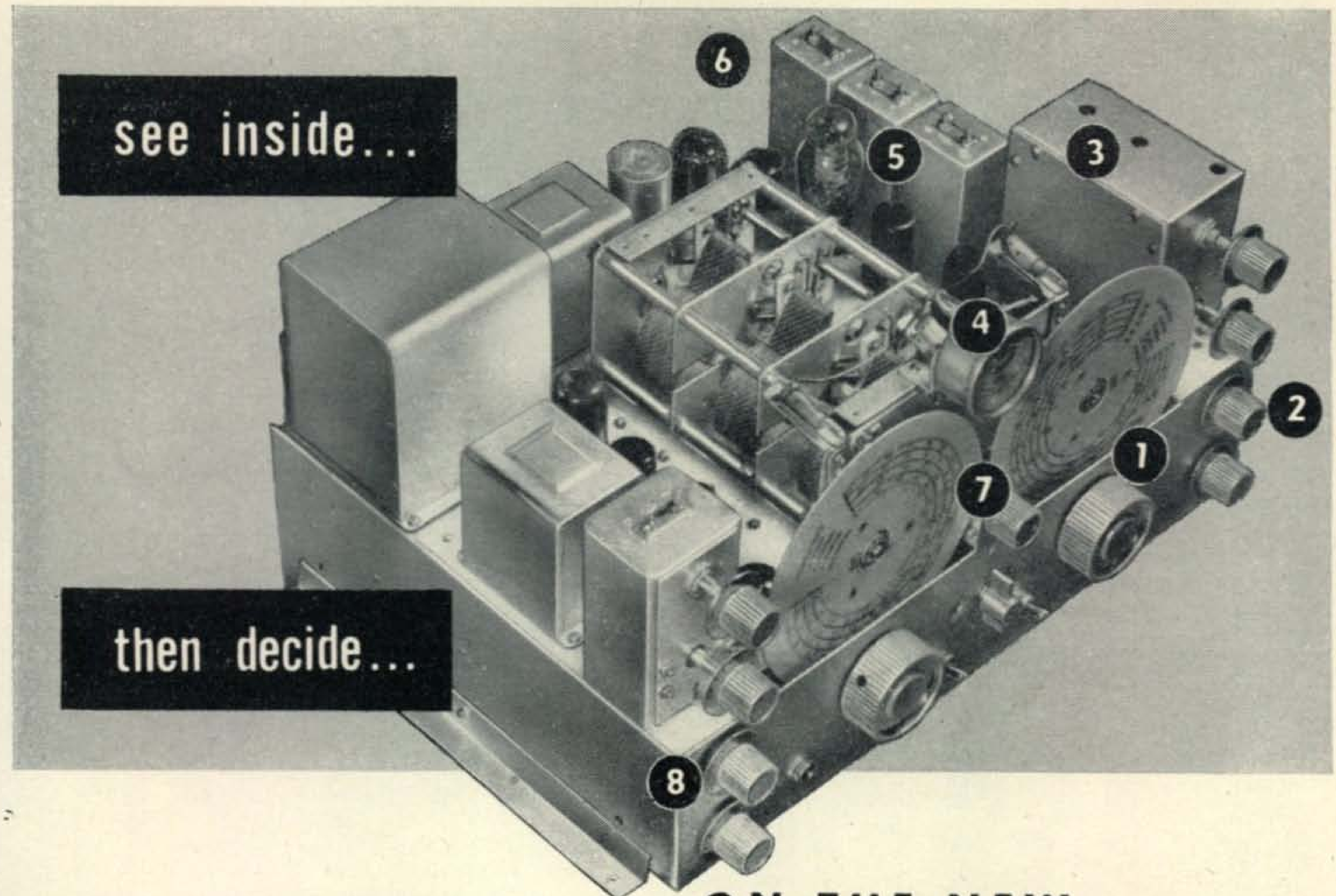
Oak Ridge, Tenn.

Editor, *CQ*:

Add my name to the list of those desiring a spot in *CQ* for traffic men.

Harold Walchi, W4TWI

Sufficient reader interest may be brewing, and if someone starts the ball rolling we promise a report to all who participate.—Ed.



ON THE NEW

NATIONAL NC-173

- **RANGE: 540 kcs to 31 mcs plus 48-56 mcs**
- **TUBE COMPLEMENT: 13 (including rectifier and voltage regulator)**

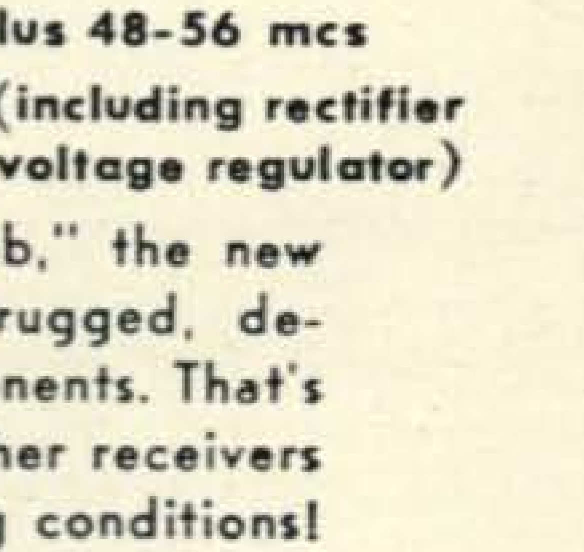
Not just another "assembly job," the new NC-173 is constructed with rugged, dependable National-built components. That's why it outperforms, outlasts other receivers in the field under all operating conditions! Try it at your dealer's today.

$189.50 *(with PM speaker)*

1. Calibrated electrical bandspread for 6 10-11, 20, 40 and 80 meter amateur bands!
2. Automatic noise limiter effective on both phone and CW, with adjustable threshold!
3. Highly flexible crystal filter provides 6 steps of selectivity!
4. S-meter for both phone and CW!
5. New temperature compensation and voltage regulation assure exceptional stability!
6. Accessory socket for NFM-73 adaptor!
7. Trimmer control permits panel adjustment of RF stage!
8. Tone control. Phono input jack also provided.

NFM-73 adaptor makes the NC-173 a real NFM receiver! Instant selection of AM or NFM from front panel.

$17.95



National
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NATIONAL COMPANY, Inc.
MALDEN, MASSACHUSETTS

Feenix, Ariz.
AIR-MALE RUSH

Deer Hon. Ed.:

Scratchi are come up with a stoopendus idea concerning DX, and knowing that you quite a DX man he are quickly riting you so you can be on grounded floor. I are getting idea while looking over all my QSL cards. As you are knowing, Hon. Ed., I working all my DX under a varieties of call letters. It are therefore very impossible to using these cards to obtaining fancy DX certificates to hang on Hon. wall. Also, I are not doing as well as should be expecting, dew mainly to fact being near west coast, and not having advantages of working many countries like W ones and twos are having. So, I are deciding to issue my own DX Certificuts, as that way are sure of getting one myself. Hee, hoo aren't that a slicky? After much clashing of gears in hon. brain, I are coming up with following hot stuff.

Instead of working countries or continents or zones, Scratchi are dividing the world up into 25 districks. Each districk are very carefooly chosen so that there are several easy-to-work countries in each districk. I are also choosing districks so that I are having QSL cards from each one allready. This are natchrally making some districks big, some small, some fat and some thin. I are sure a Districk Map all dollied up with fancy colors will be welcomed to cover up holes in ham shack walls. Brother Itchi now seeing printer to making up several samples of map.

On acct. just working all 25 districks are too easy for everybuddies unless Scratchi make it harder, I are scratching hon. noggin and coming up with a set of rules, which I are quoting below for first excloosive printing in your Hon. rag.

RULES FOR
CONTACTED ALL DISTRICKS
SIRUPTISHALLY CERTIFICUT

(Stashuns applying for certificuts must follow any two of the three rules)

1. Operashun must be out of band or else zero-beet on DX stashuns frequency.
2. See-w stashuns must not use any note better than T-5; Phoney stashuns must modulating a minimum of 90 poorcent.
3. Inputs powers to final must not be going below one kilowhats.

Pink tickets from FCC will be considered as proof that applying stashuns complying with above rules. Newly stashuns on air not having had time to collecting pink tickets must sine statement swearing that rules were followed.

Any amchoor meeting aboves rules are eligable to apply for his Contacted All Districks Siruptishally award. I are having Certificuts No. 1 of CADS. Scratchi are certianly proud of being No. 1 CADS. However, I are sure that many other amchoors are to be striving shortly to winning certificuts so that can putting CADS on qsl cards. What saying, Brother CADS?

Fraternally,
Hashafisti Scratchi

PYROVAC. . . A NEW EIMAC PLATE MATERIAL

The story's out . . . Pyrovac, a new Eimac plate material, the culmination of ten years research and millions of hours of life test data, is now in standard production—at no extra cost.

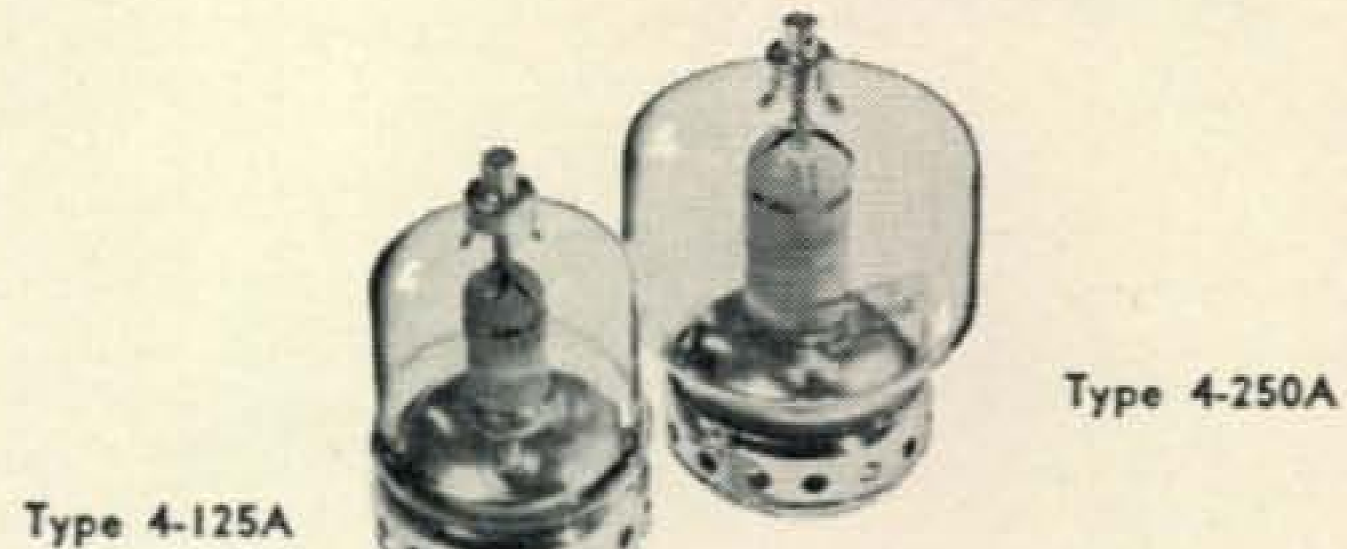
Pyrovac is truly as important a milestone of vacuum tube development as the thoriated tungsten filament. Pyrovac plates, like the thoriated tungsten filament, open a new vista for vacuum tube life performance.

This new material combines the advantages of tantalum to overloads, molybdenum's strength, weight and conductivity, and carbon's ability to dissipate heat . . . with none of the disadvantages of these materials. Tubes with Pyrovac plates are mechanically rugged, require no additional getters and they do not gas even under extreme overloads.

The life span of tubes with Pyrovac plates far exceeds that of tubes incorporating plates of conventional materials. For example, under conditions where a tube gave 3000 hours of service, the same tube type with a Pyrovac plate gave 15,000 hours of life, a 400 percent increase!

Pyrovac plates are capable of handling overloads in excess of 1000%. For instance, the 4-65A plate pictured above was radiating 900 watts of heat, a 1280% overload . . . without indication that the eventual life of the tube or its characteristics were affected. We don't suggest you dissipate 900 watts of heat in your Eimac 4-65A's (you could probably do it), but this example establishes proof that Pyrovac is a superior plate material destined to become the anode standard of the vacuum tube industry.

Pyrovac plates were first incorporated in the Eimac 4-250A in the early part of 1946 and followed in the 4-125A As a result there has been universal acceptance of these tubes in all fields of electronic endeavor. . . . Further proof of the superiority of this new plate material. In the ensuing period of



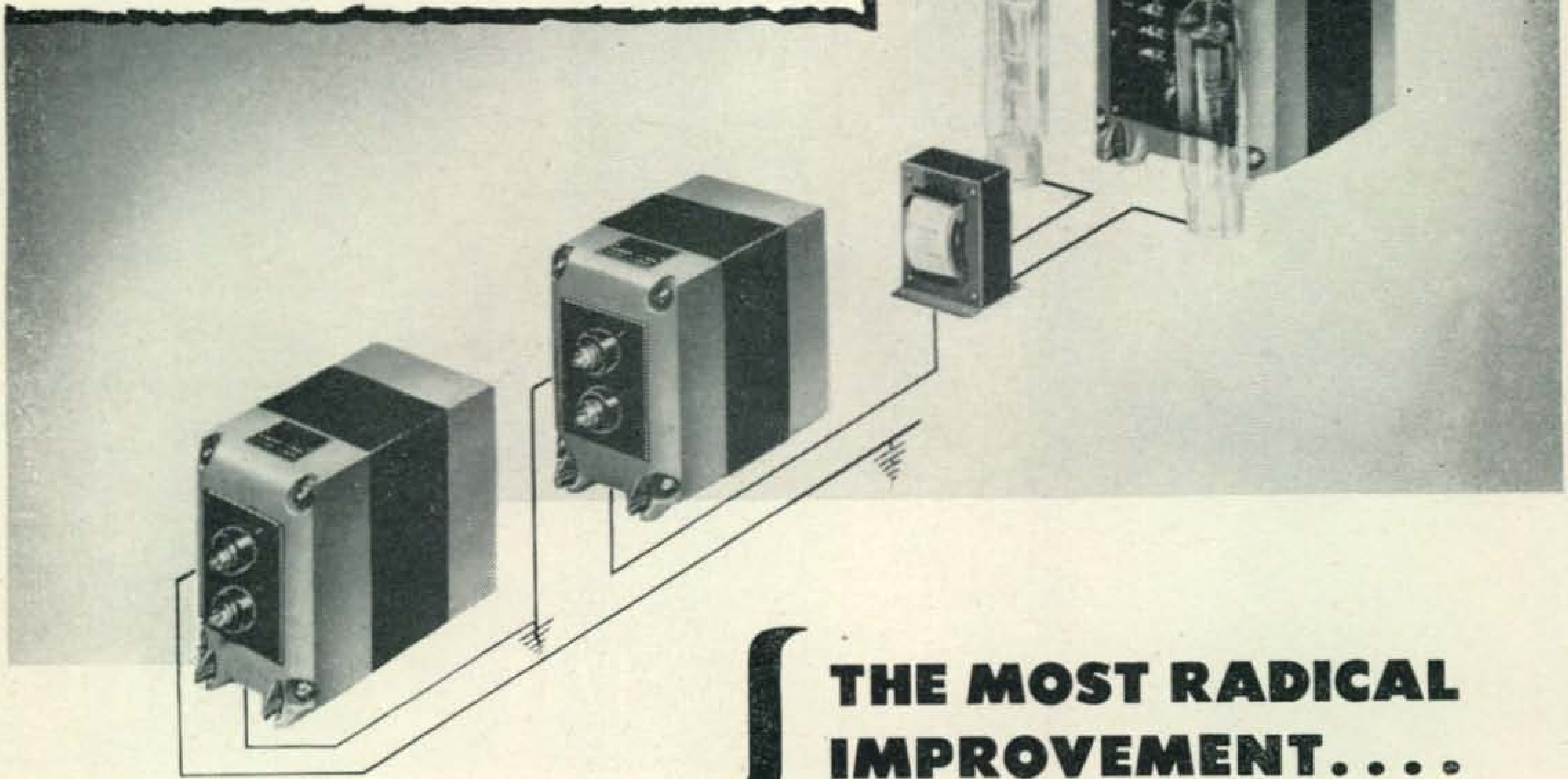
time all Eimac internal anode type tubes have been converted to Pyrovac plates as rapidly as production facilities would allow.

For your assurance to obtain the most in performance and satisfaction for your vacuum-tube-dollar, insist on Eimac tubes . . the criterion of good design in any electronic equipment.

EITEL-McCULLOUGH, INC.
190 San Mateo Ave.
San Bruno, California

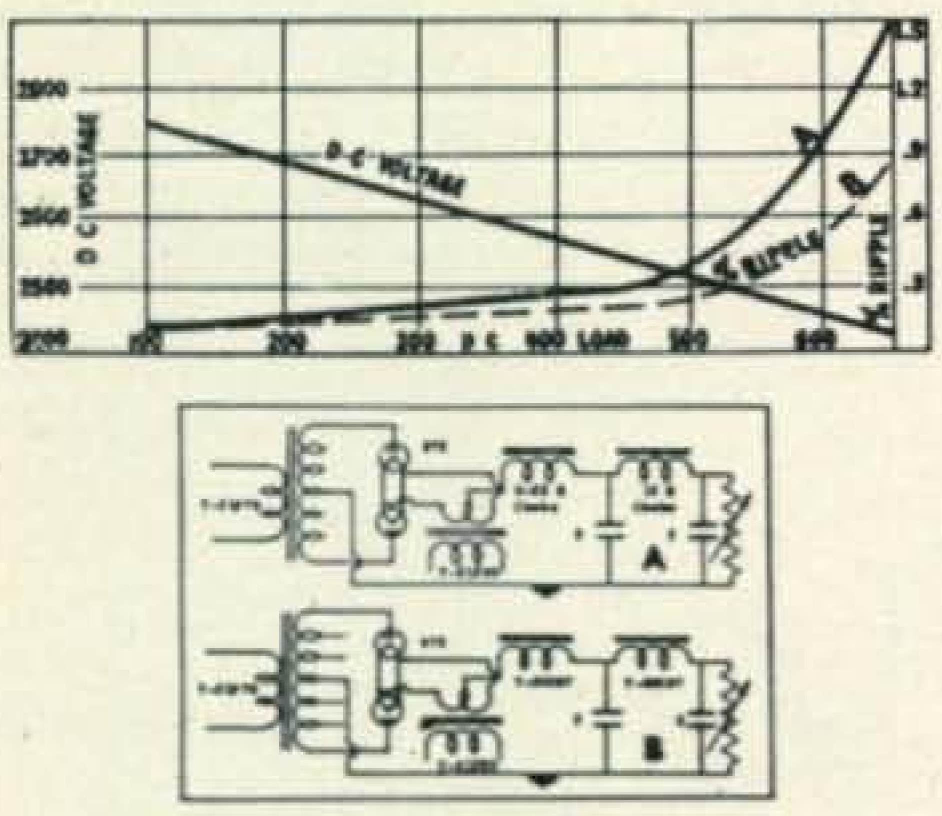
Follow the Leaders to
Eimac TUBES
The Power for R-F

THORDARSON



THE MOST RADICAL IMPROVEMENT.... IN POWER SUPPLY FILTER CIRCUITS...

... employing two same type universal chokes that provide more efficient filtering.



Actual Laboratory Measurements Made With The Conventional Type Filter Circuit A — (Swinging and Smoothing System) — and with the New Universal Choke Filter Circuit B Show A Decrease In Ripple Throughout The Useful Current Range of Power Supply

Here again, is another triumph in Thordarson engineering skill. Thordarson engineers have developed a new universal type choke in sizes to meet all power requirements! This achievement offers the best possible filtering and regulation in a minimum size consistent with conservative design! One reactor may be used in a single section filter with all the advantages of the radically swinging type. Two similar units may be employed in a two section filter more satisfactorily than the obsolete "swinging and smoothing" system, and deliver far better performance.

Let us know how we can put these new universal chokes to work for you... Send us your requirements.

For Matched Power Supplies, see Your New 400GX Catalog Now Available. Furnished Free Upon Request.

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E D I T O R I A L

AMATEURS EVERYWHERE are becoming increasingly concerned with the problem of adequate public relations. Considerable effort toward this end is being exerted by individuals, clubs, and associations, but we have long felt that perhaps not everything that might be done has been undertaken. Throughout the United States there are hundreds of radio clubs, the meeting place for men with a great common interest. It has been through the work of these clubs that some of the finest work has been done in the public service. This idea of public service cannot be over-emphasized for it is on the basis of public interest that amateur radio as we know it exists. It is hardly necessary to reiterate the many arguments on behalf of the amateur, nor to cite the unqualified support given to hams by the military services. Where the amateurs need increased support is from the public at large. How can this be accomplished?

We at *CQ* have given the project a great deal of thought. As active amateurs engaged in editing and publishing a radio journal, we could hardly constitute ourselves as the sole public relations organization for all amateur radio. However, with a magazine available there seemed that there must be some solution to our dilemma. So obvious was the answer that it all but escaped us. The rather apparent solution is to let amateur clubs themselves do their own selling job to the public. The editorial pages of *CQ* then can make known the projects and the deeds of the clubs. In short order the local groups will accomplish more, in this particular field, than any central office, such as ours, might. There are, as we all know, many endeavors which are more properly handled from a central office by a central group. But publicity and organized public service must be molded to the tastes and requirements of the individual community. A publication such as *CQ* can offer its facilities to bring to the forefront the best efforts in behalf of amateur radio, and that is our aim. To offer recognition to the clubs that perform the greatest good for their communities, the editors and publishers of *CQ* are creating an award to be made annually to radio clubs of the United States and its possessions.

You will note that we have referred to "clubs" instead of to a "club" . . . there is a reason for this. In any measure of public service, the direct benefit to the community must be the paramount measure. In times of crisis and emergency, when hams invariably perform great deeds, it is to be expected that some one group could probably win an award for public service, hands down. On the other hand, a club which has performed yeoman service, week in and week out, should not necessarily be deprived of an opportunity for recognition because of its good fortune to be spared disaster. The *CQ* Annual Club Award, will therefore be made in two classes. Class One will be to the club making an outstanding contribution to its community throughout the year. Class Two will be to the club which makes the greatest contribution to the community in an emergency.

Conditions for applying for the award are extremely simple. In January of each year, applications for both awards for the previous year will be accepted. Standard application blanks will be available, but they need not necessarily be used. Most important is that the club applying for the award must have been in existence for at least one full year prior to making application for the award. At least 60% of the membership of any club applying must be licensed amateurs. If at any time during the calendar year membership falls below this figure, the club is ineligible for the award.

A handsome trophy will be awarded to each club judged the winner in its class. The trophies will be awarded on a permanent basis and become the property of the winning club. Individuals participating in the activity of the club for the full year period and the individuals participating in the emergency activity upon which the Class Two award is based will also be the recipients of individual awards.

The type of activity which might qualify a club for the Class One award is typified by that of the Miami radio club which instituted a verteran's training program in amateur radio. The scope of the award includes such activities as organized code classes and amateur radio training, organized emergency networks such as now exist in many communities as a carryover from WERS, an organized attempt to minimize BCI and TVI, etc. The Class Two award might go to a club which provided emergency communications in time of a fire or other similar emergency. The work of the MVARC, described elsewhere in this issue, might make it eligible under either class, depending upon the quirks of nature. The establishment and maintenance of the fire network,regardless of its actual use, would certainly be praiseworthy. If they were called to active emergency duty, as was the case recently, they might qualify under Class Two. In no instance however, will both awards be made to one club for the same activity, although it is conceivable that one club could receive both awards for different activities.

The board of judges will be announced sometime during the year and will be comprised of prominent amateurs. Their decision will be final in all cases. First awards will be for 1948.

To summarize the rules and regulations for the *CQ* Annual club awards:

1. There will be two annual awards, one for activity extending throughout the year and one for emergency activity only.
2. Any bona fide members of an eligible club may apply on behalf of the club, but a formal, notarized application must be submitted (an affidavit if the club is among those chosen for final consideration).
3. Any amateur radio club whose membership comprises 60% or greater licensed amateurs throughout the calendar year prior to the application for the award, is eligible.
4. Any amateur radio club that has been in existence one full year prior to the application for the award is eligible.
5. There is no charge for application, and no other special requirements than those outlined above.

IMPORTANT NEWS

FOR VETERAN AND TYRO HAMS ALIKE

The new Collins 310B-1 and 310B-3

The 310B was first designed as a versatile, bandswitching self-powered exciter unit built around the highly stable and accurate Collins 70E-8 PTO, for use on the 80, 40, 20, 15, 11, and 10 meter bands.

However, the pilot model's excellent behavior, and an input of 40 watts on all amateur bands under 32 megacycles, led to the question as to how it would perform as a low power CW transmitter. The result was so gratifying that it was decided to offer the 310B in two forms. The first, the 310B-1, has a link circuit output to work into a final of higher power. The second, the 310B-3, has a series-parallel tunable antenna network of the universal type, which will match any antenna having an integral number of ¼ waves in length. Except for their output circuits, the 310B-1 and the 310B-3 are identical.

The 310B-1 is a highly satisfying exciter unit, with all the flexibility, accuracy and stability assured by the 70E-8 PTO. With additional multiplication it makes a reliable frequency control for amateur bands in the VHF and UHF regions. The 310B-3 will find many uses around any shack. It is an excellent standby transmitter, is a natural for spot frequency network, and is the answer for emergency work due to its low power source requirement. And for the beginner in ham radio, it is the ideal combination of top performance and low initial investment. Later, when more power is called for, none of this investment is sacrificed. It is only necessary to add a final amplifier of higher power. Write for the Collins exciter bulletin describing these and other units.

Net prices to amateurs, complete with tubes and instruction book, F.O.B. Cedar Rapids, Iowa:

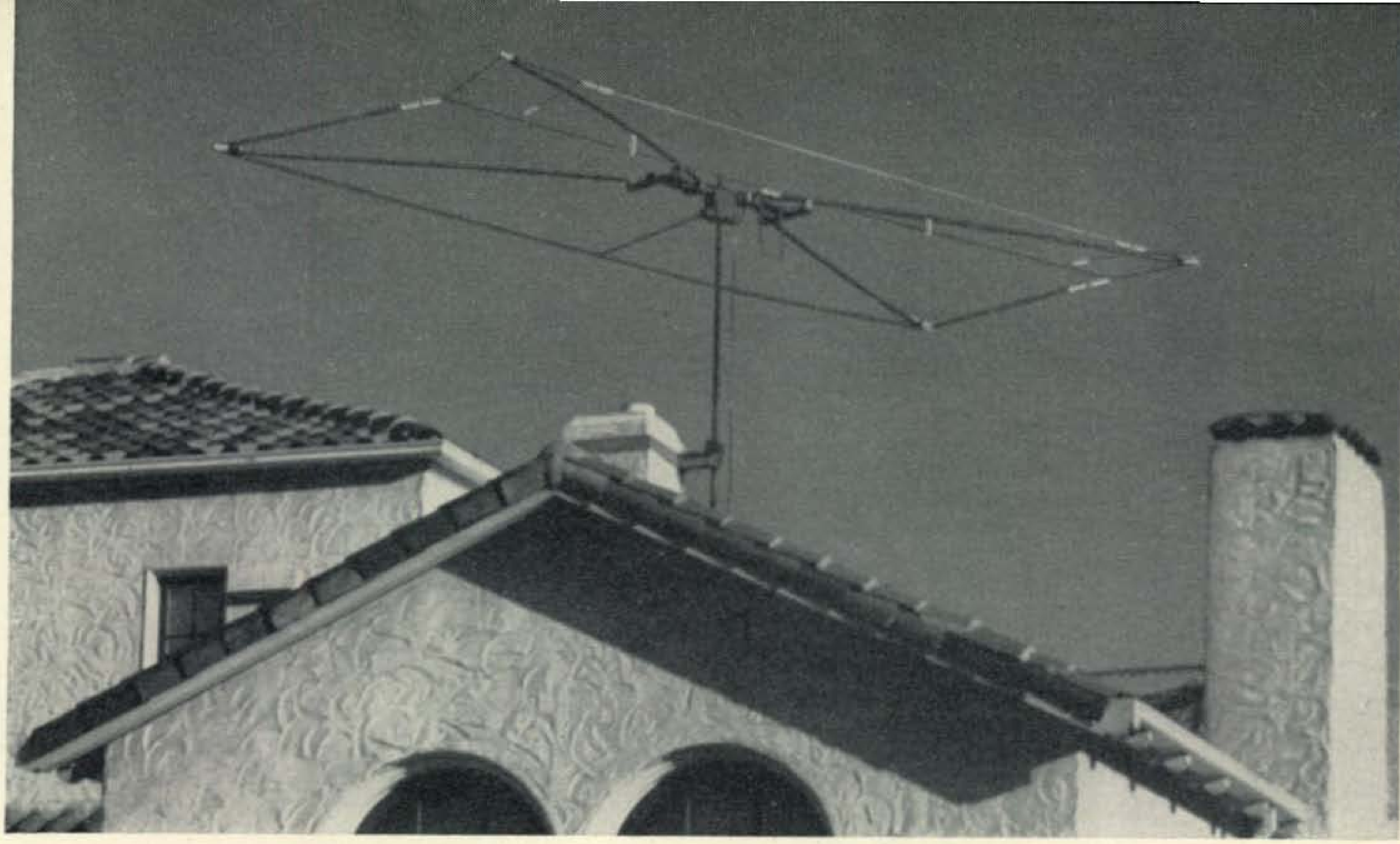
310B-1 Exciter $190.00
310B-3 Transmitter and Exciter 215.00

Terms, if desired, 20% cash with order; balance, plus 5% carrying charge, in twelve equal monthly installments.

FOR BEST RESULTS IN AMATEUR RADIO, IT'S . . . COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street, New York 18, New York — 458 South Spring Street, Los Angeles 13, California



The Cobweb

C. F. BANE, W6WB*

A sure-fire snare for DX, yet 40% shorter than a conventional array, this 2-element rotary beam is the average ham's dream come true.

THIS IS THE STORY of a rather unusual beam antenna that started out purely as an experiment but, like "The Man Who Came to Dinner," is still with us!

There have been so many ingenious mechanical arrangements for beams published that there is little doubt but that our particular structural design is not original. However, this is merely a means to an end—the worth of our antenna is not in its peculiar rotary cobweb effect (so my wife says), but rather in the fact that its physical length is only about 60% of the normal beam. Coincidentally, this figures out roughly to be about one foot per meter, i.e., 20 meters, 20 feet—10 meters, 10 feet. Judging by the number of amateurs who complain of lack of space, such a shortened beam may find ready application particularly since it is also very lightweight and consequently imposes no partiular rotating problem. Ours turns nicely when driven by a pair of No. 5 Selsyns (the "slave" driving the antenna supporting shaft through a 100:1 worm and Bull-gear reduction[1]).

It is felt that further mechanical description is needless in view of the completeness of the photographs and drawings, therefore subsequent remarks will deal principally with electrical design considerations. There is reason to believe that some of the material to follow, while specifically aimed at the bean under consideration, may well apply to the design and adjustment of more conventional types.

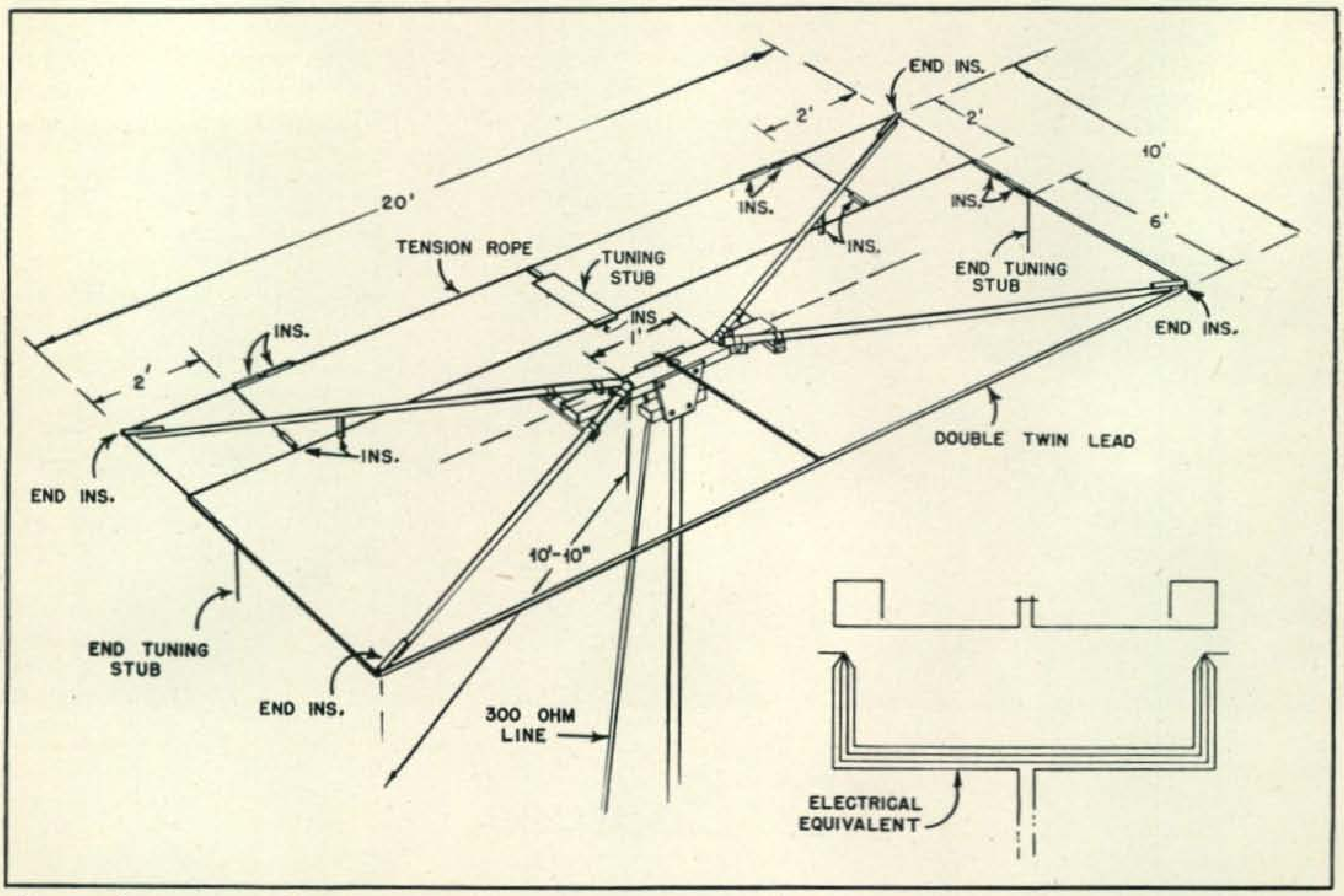
Shortening Methods (Center Loading)

There are only a few practical methods whereby an antenna can be shortened from its normal resonant length so as to fit into some available space. The most common method is to shorten the antenna and restore resonance by inserting inductance in the center portion of the antenna. This system has been previously described in *CQ*[2]. The inductance may be in lumped form as provided by a coil or in the form of a closed-end stub. An antenna can be shortened by this method to the point where it is merely a large coil with stubs protruding from opposite ends but it is highly questionable whether such an arrangement will do much radiating. Even assuming the elements to be of reasonable length, one must take into account the fact that, as an antenna is shortened and resonated, its radiation resistance will decrease. Hence (for a constant input power), the current in the center of the antenna will increase. Bearing in mind that the total power is distributed between the radiation and loss resistance ($W = I^2(R_{rad} + R_{loss})$) it can be seen that when the radiation resistance is equal to the loss resistance, 50% of the available power is wasted. When the radiation resistance becomes very low it doesn't take much loss in the loading inductors (skin-effect, resistance at the connections, etc.), to cause trouble. Further, as the

*155 *Saint Elmo Way, San Francisco, Calif.*

[1]Hays, "Selsyn Beam Rotator," *CQ*, Feb., 1948

[2]Weichert, "The Shortened Beam," *CQ*, Sept., 1947



Support booms are of bamboo. Diameter at base averages 1¼". Diameter at tip averages 1". Center support piece is 2" x 3" x 4'. Pipe clamps are used to fasten booms to center support piece.

radiation resistance is lowered, there will be a rapid increase of voltage (and impedance), at the ends of the shortened elements. When very short elements are used corona and dielectric losses can be substantial. Anyone who has ever had occasion to load a short antenna in the 200-400 kc region will tell you that this type of loss is not to be taken lightly! These remarks are not aimed at the writer of the previous *CQ* article since his shortening of the elements was quite conservative and if our statements apply at all they do so only to a very minor degree.

End Loading

It will be obvious that an antenna shortened to a length substantially less than that for self-resonance will appear as a capacitive reactance, therefore it will be necessary to add inductive reactance (center coil or stub) in equal amount to bring the antenna to resonance. It is reasonable to expect that if we can somehow increase the capacity of the antenna we will *decrease* the capacitive reactance thereby requiring less inductive reactance (smaller coil, less losses), to restore resonance. This capacity increase can be achieved by enlarging the diameter of the conductors, or by adding plates or copper mesh at or near both ends of the antenna. This method of capacity end loading is used in the parasitic element of our particular beam by arranging the folded-back sections of the wires to form a two-foot square. This is clearly shown in one of the illustrations. By the combination of the added length gained by the folding and the end-capacity we are able to reduce the length of the center tuning stub to a negligible value, the reasons for which will be subsequently mentioned.

End Folding

One system which suffers none of the disadvantages of either of the two previously mentioned is to use the full electrical length for the elements and to condense the system by folding back a small portion of the antenna on either end. This method should closely approach the performance of non-shortened antennas since the high current center portion is completely in the clear. Present theory indicates that the portion of the antenna in which the highest current flows produces the greatest field strength. Thus in the case where a center loading coil is used, it would appear that since this high current flows mainly through the turns of the coil (which in itself contributes little to the radiated field), results might not quite equal the non-coil system. In any case, field strength measurements here indicate that there is little if any difference between a full length dipole and one in which only 60% of its length contributes to the forward (and rear) radiation (the two ends are bent back, each about 20% of the total antenna length).

No tests were made with the parasitic element as a radiator although it is felt that since the ends are folded back upon themselves, this particular geometry may be somewhat less effective than a non-bent element.

Design Specifications

For 20-meter operation, the beam was not to exceed twenty feet in physical length; the driven element to be full electrical length but to have approximately 6' bent back on each end. The director was to be 20' long and tuned near self-resonance by forming the folded-back end sections into open circuited squares approximately 2′ on a side. Exact tuning in this latter element was to be accomplished by a center stub line not over 2′ in length. This latter requirement places the high current loop in the linear portion of the parasitic element rather than in the closed tuning stub. It was further decided to arrange all bent-back portions of radiator and parasitic element in a horizontal plane rather than to bend them up or down; this in an attempt to avoid any possibility of vertical pickup on these sections which might tend to mask the normal directional characteristics of the system.

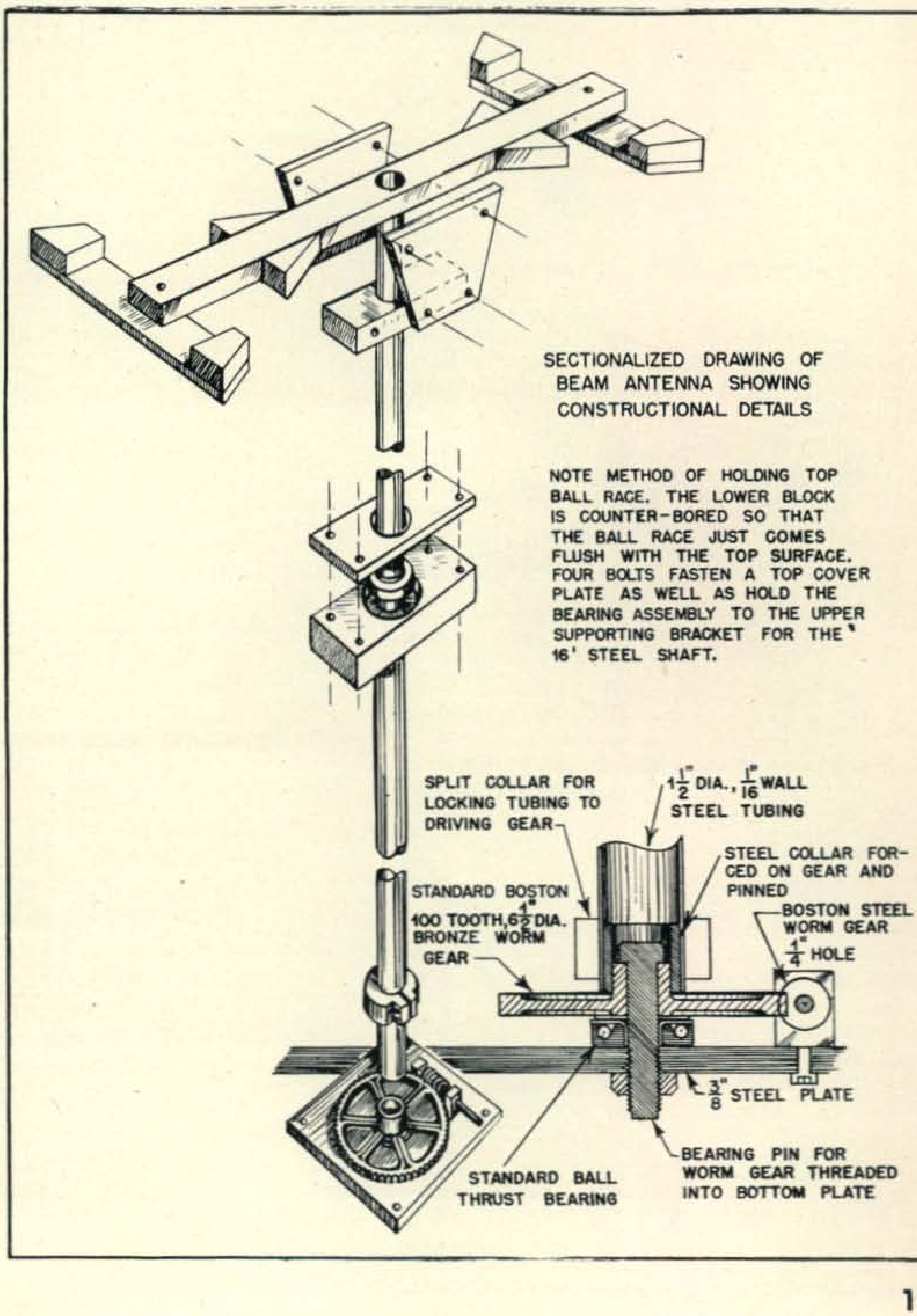
Center Impedance of the Driven Element

In considering line matching to this or similar antennas one should have some general idea of the approximate center impedance of the driven element. The familiar published curves show that a dipole may have a center impedance anywhere between 60 and 90 ohms, depending upon height above ground, so that we may well take these figures as limits and work from there. The presence of the parasitic element spaced one tenth wavelength and tuned as a director can reduce the driven element center impedance to values somewhere between the extremes of 10 and 30 ohms. The probability of experimentally determining the exact impedance of the driven element is extremely remote, therefore, as long as we have to guess,it will be well to reduce the error as much as possible. If we take the geometric mean value of impedance of a dipole by itself (between the possible limits of 60 and 90 ohms), we come out with 73.5 (plenty close enough to the sacred value). Then, if we take the mean value of impedance of a driven element in the presence of the director (assumed to lie between 10 and 30 ohms), we arrive at a value of 17.3 ohms. Therefore our *average* ratio of drop-off in impedance due to the presence of the parasitic element can be assumed to be 4.25:1. It's a guess but as measured results show, it's not too far off to be reasonable. Some such ratio information is necessary when using multi-element dipoles as a means of matching the impedance of the antenna to some selected value of transmission line since it then becomes possible to determine the number of parallel elements that will be required to effect the necessary transformation.

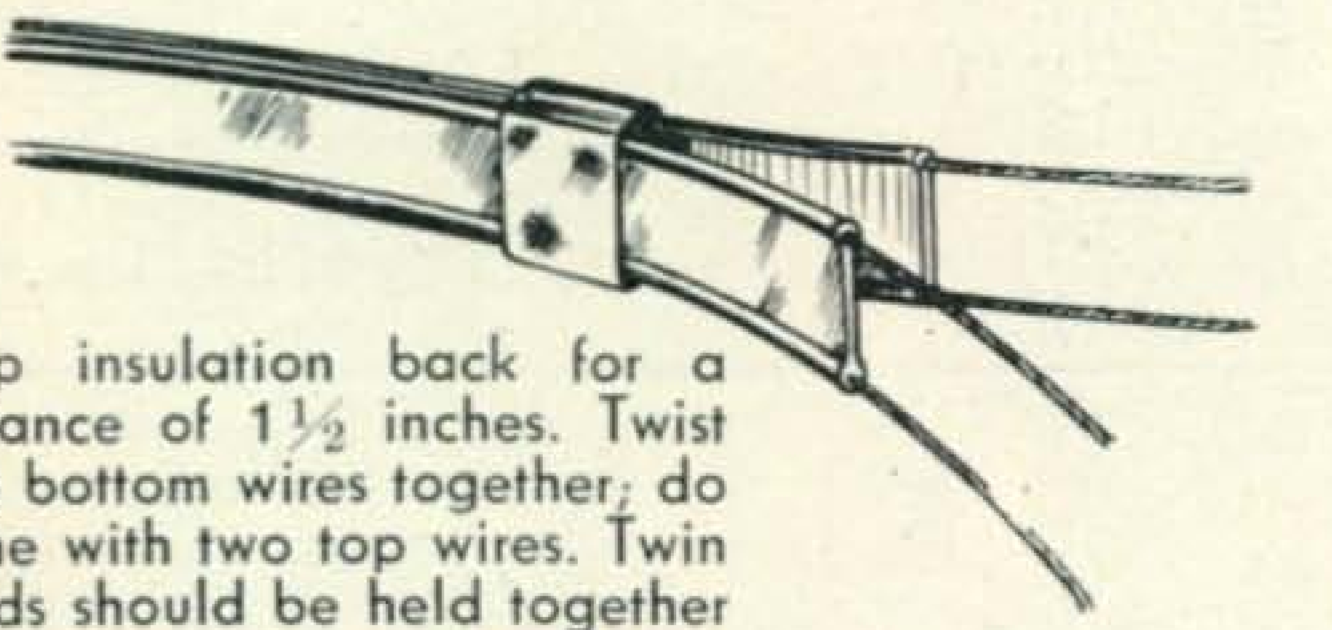
Multi-Element Dipoles

Since it was our desire to use a 300-ohm balanced line to feed this beam, a multi-element folded dipole appeared to offer the best possibilities of transforming the low center impedance of the driven element to the higher impedance of the line. The theory of such multi-wire dipoles was fully treated in an excellent article by Peter Bach, W2GWE[3], therefore little further mention need be made in this regard. Suffice it to say that the impedance at the center of *any of the wires* of a multi-wire doublet can be approximated by multiplying the assumed 73.5 value of a single dipole by the square of the number of parallel dipoles to be used (this assumes among other things that all

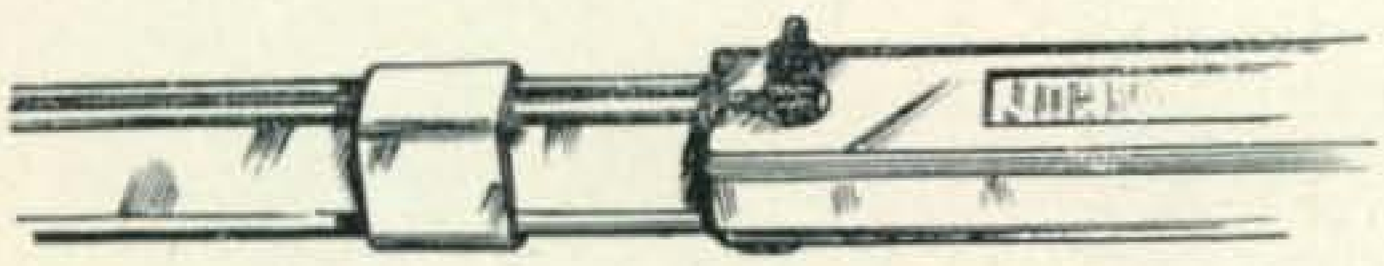
[3]Bach, "The Trombone T," *CQ*, Mar., Apr., 1947



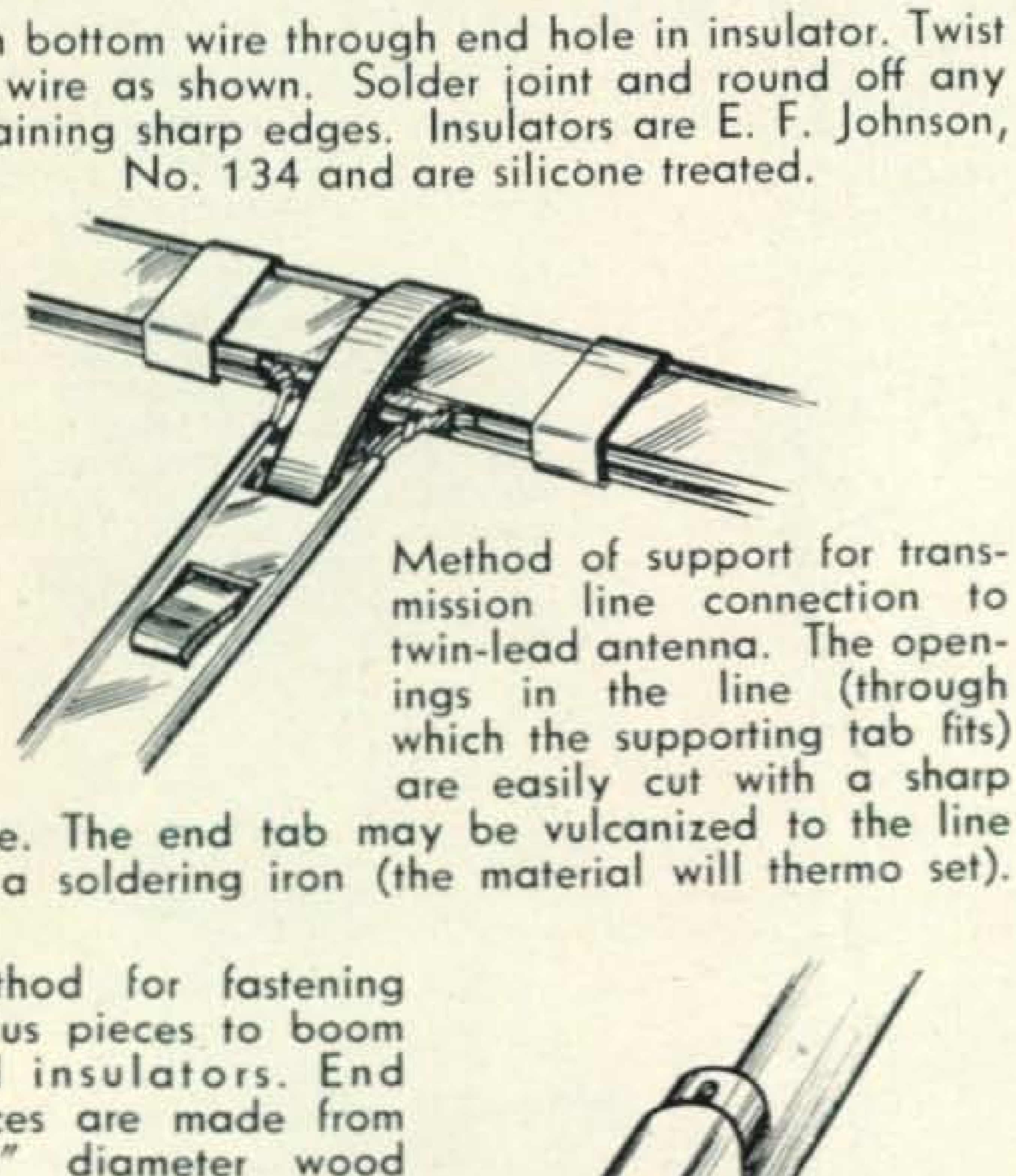
conductors are of equal diameter, that there is no phase difference between them and that the currents are all equal). In our previously stated case, we assumed that our 73.5 ohm figure would be reduced by a ratio of 4.25 when the director was added, therefore, instead of using 73.5 we take $\frac{73.5}{4.25}$ or 17.3. Now if we arbitrarily select a four-wire doublet, the arithmetic comes out, $4^2 \times 17.3 = 275$ ohms (approx.). Thus on a guesswork basis we have set up a match for our 300-ohm line that is within 1.1 : 1 ! Oh, that it could be that simple! Measurements on the the present beam, however, show S-W-R values of less than 1.5:1 which should be quite acceptable particularly in view of the convenience of a directly connected 300-ohm line without need for matching or tuning adjustments of any kind.



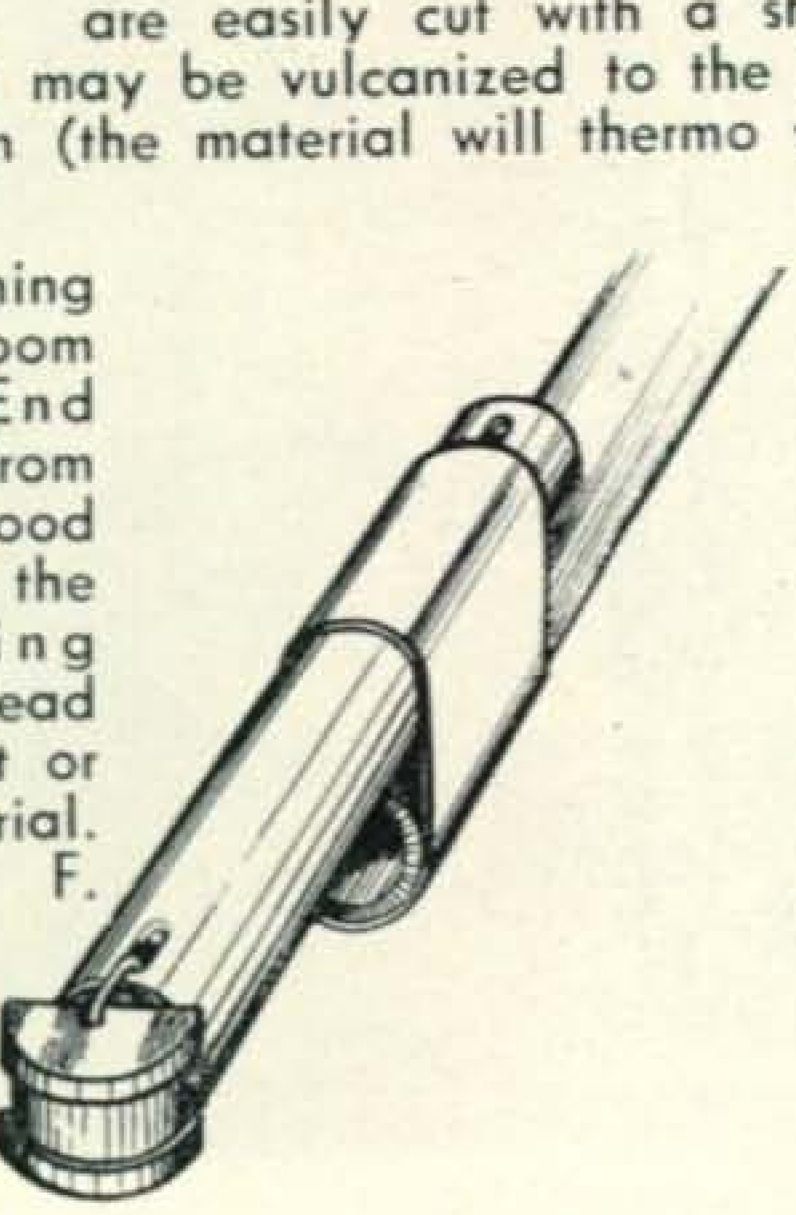
Strip insulation back for a distance of 1½ inches. Twist two bottom wires together; do same with two top wires. Twin leads should be held together with tape serving each two feet.



Push bottom wire through end hole in insulator. Twist top wire as shown. Solder joint and round off any remaining sharp edges. Insulators are E. F. Johnson, No. 134 and are silicone treated.



Method of support for transmission line connection to twin-lead antenna. The openings in the line (through which the supporting tab fits) are easily cut with a sharp knife. The end tab may be vulcanized to the line by a soldering iron (the material will thermo set).



Method for fastening radius pieces to boom end insulators. End pieces are made from 1½" diameter wood doweling sawed in the center. Retaining grooves for twin-lead may be readily cut or filed in this soft material. Insulators are E. F. Johnson, 8".

Matching S-W-R

A further bit of pencil work will show that even with the widest variations apt to be encountered in practice an impedance mismatch of much over four-to-one is highly improbable. How then can we sometimes get those eight and ten-to-one S-W-R? The answer may be in the possibility that the line may be looking into a substantial reactance instead of the purely resistive impedance necessary for lowest S-W-R. The presence of the parasitic element will couple reactance into the antenna, the sign and degree of which will depend upon the spacing and the tuning (length) of the parasitic element. It is almost impossible to obtain a low S-W-R if the line looks into a complex impedance and the only practical way to correct this condition is to tune out the reactance by changing the tuning of the antenna (assuming the tuning on the parasitic element to be fixed). This applies equally to multi-wire doublets and may serve to demonstrate that in the presence of the second element they are *not* broad-band in the sense that they will not remain purely resistive over a wide frequency range. As the transmitter frequency is changed beyond the frequency to which the antenna system was initially tuned, the antenna becomes reactive as attested by the relatively rapid rise of S-W-R on the transmission line. In contrast, a four-wire folded doublet without parasitic elements is normally resistive over several hundred kilocycles, so much so in fact that it is almost impossible to locate an exact resonant frequency.

If a minimum S-W-R is sought, it will be absolutely essential that provisions are made to tune the multi-wire driven element. A check on S-W-R over a few hundred kilocycles will definitely show the resonant point of the antenna since the S-W-R will be the lowest at this frequency. The accompanying curves illustrate this point and are particularly pertinent since they are taken from the line of the antenna system under discussion. These curves indicate that the beam will work nicely over some 200 kilocycles in the 20-meter band without excessive S-W-R. It will in fact work reasonably well over the entire band (and has), but with an increase in S-W-R, which while it may not result in excessive losses does tend to make the loading on the final amplifier fussy amd critical. There is, of course, the definite possibility that the effects discussed may be exaggerated in this type of beam due to its peculiar geometry and that the rise in S-W-R off the resonant frequency of the antenna may not be so marked in other beams incorporating wider spacing.

Back to the curves once again—note the effect of rotating the antenna. In one curve the *antenna* part of the beam is directly over the house; the other curve is for the director in this latter position. Unfortunately the antenna is quite close to the roof (this being a carry-over from the "experimental only" days), and it is interesting to observe that the S-W-R and resonant frequency of the antenna both change when the beam is turned so that the driven element is over the roof. The peculiarities of the two curves are no doubt due to the fact that the system is coupling into the lighting circuits of the building (an understatement!).

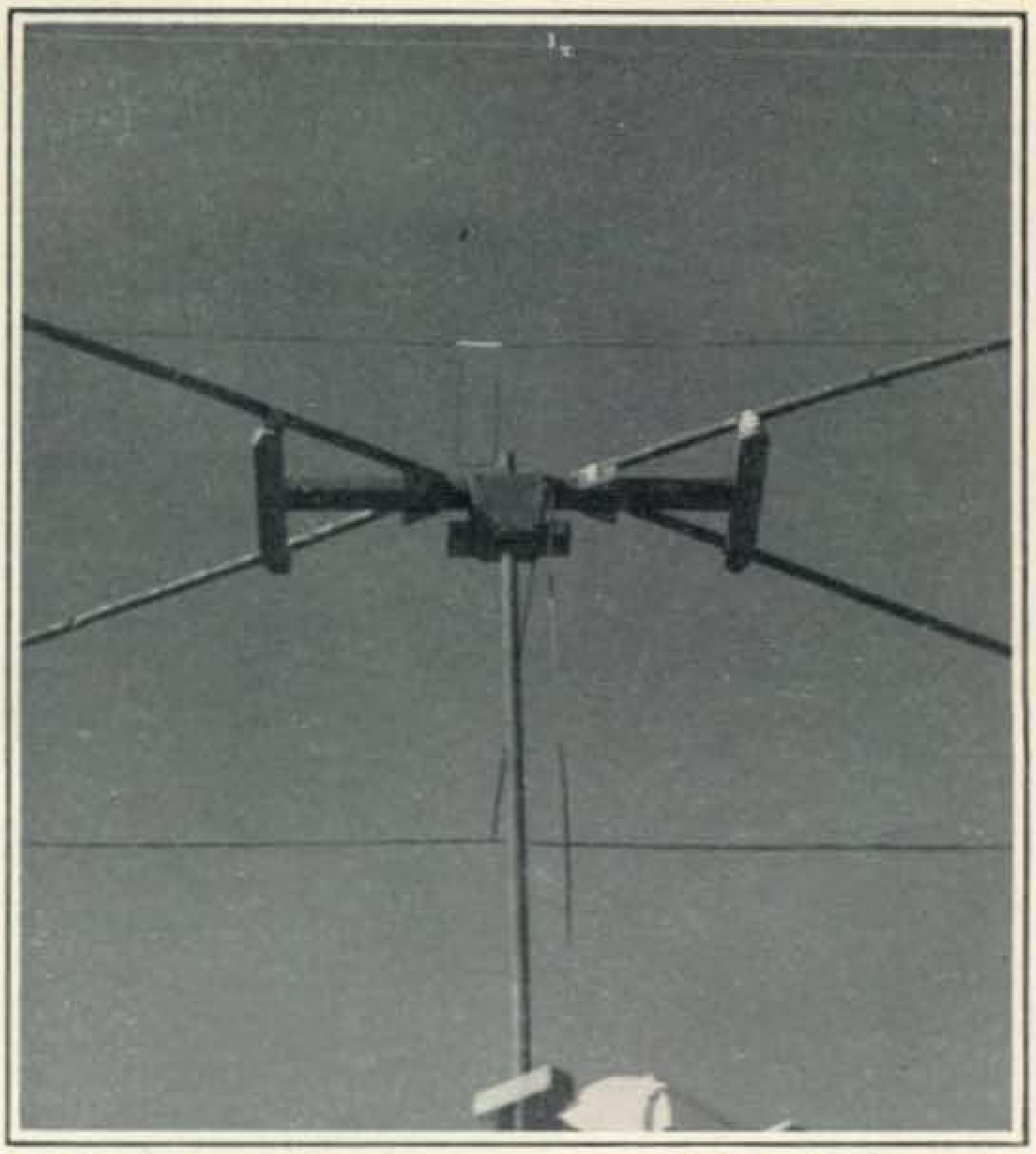
The Driven Element

The driven element (four-wire doublet) is made from two identical lengths of 300-ohm twin lead taped together (tape servings every two feet). The four wires on either end are joined together and one of the wires opened in the center for the 300-ohm twin lead feeder connection. Mechanically, the 150-ohm lead might be a bit easier to handle and was in fact incorporated in one of the original experimental versions of this beam. No concern need be felt as to the adjacent wire insulation since the currents in all wires are in phase, therefore there should be no potential difference between any of the wires throughout their length.[4] In an early try with the 150-ohm material, the insulation rubbed through on two of the wires and they shorted together. This, of course, made an entirely new situation as regards difference of potential and the shorted portion quickly blew through to the two unshorted wires. Result, a fused mass!

Since the two end sections of the driven element are folded back, care must be taken to insure that the twin lead does not bend around too sharp a corner at the supporting insulator (one of our early mistakes). Note that we have made supporting pieces from $1^1/_4''$ dowels so that the twin lead will have a radius around which to bend.

Insulation at and near the ends of both the parasitic and driven element is very important! Initially, the insulated twin lead looked so good that little care was taken in the antenna insulation other than at the extreme ends. This proved to be a mistake. You have no idea of the amount of r.f. on the ends of either the parasitic or driven elements until you feed about 500 watts into the system and try some sparks for yourself. The photograph of the ends of the beam will show the small tuning stubs on the ends of the double twin-lead antenna wires. These were spaced away from the end insulators about two inches and nothing more was thought about them until we took the photographs, at which time they were outlined against the sky and looked peculiarly black. The investigation that followed disclosed that the end tips were fused into nice little balls, this interesting addition being undoubtedly caused by an arc to the wire link joining the two end insulators (a distance of at least two inches)! This was enough for us; we replaced the stubs and this

[4]Theoretically the operation of the folded dipole is altered when the parallel conductors making up the dipole are separated by a dielectric other than air. In addition to the in-phase currents flowing along the parallel conductors an out-of-phase component also flows. The V.P. of the in-phase wave will be unaltered by the presence of the dielectric but the V.P. of the out-of-phase wave will be slowed down by a factor $\frac{1}{\sqrt{K}}$ where K is the dielectric constant. Hence substantial out-of-phase energy may flow since the source does not look into a very high impedance (quarterwave stub shorted at far end) when the parallel conductors are separated by a dielectric having a dielectric constant greater than one.—Ed.



Looking up at the center support. Note tuning stub. Top-ball-race with supporting block can be seen at bottom. This wood bearing housing is bolted to a steel band which fastens to the chimney. The direction in which you are looking is the only clear one at W6WB—up!

time let them drop at right angles to the end insulators.

From this type of insulation breakdown and arcing with less than 1-kw input, it is not difficult to understand why the W8JK type of close-spaced beam has been falsely accused of being excellent on receive but not so good on transmit. In this type of antenna the situation is usually made even worse by using a tuned feeder with an impedance gradient of a few to many thousand ohms in a quarter wavelength. The same high voltages appear at the ends of any close-spaced beam but since most parasitic element types use no insulators at the ends, no trouble can occur from this source. It will be noted that we use feeder speaders for our end insulators; however, always two or three in series are employed and the individual insulators are Silicone treated to prevent a continuous film of moisture from forming on their surfaces. In this regard, *definitely* the transmission line should be Silicone treated if it is the conventional flat type of twin-lead. This will lessen the tendency for S-W-R rise in wet weather and here at least where it often gets quite foggy, such treatment is a "must."

The Parasitic Element

As mentioned, the parasitic element has the same unbent length as the driven element (20′), the additional resonating length being made up by a combination of folded-back and end-capacity-loaded sections. Unfortunately, folding the ends back on themselves at a spacing of only 2′ has a tendency to cancel inductance (and length), therefore an additional fold-in was required. The additional capacity on the ends so obtained makes it possible to tune the parasitic element as a director with a tuning stub approximately 18″ in length.

The previous remarks as to the importance of reducing loss resistance will surely apply to the tuning stub since the shorting bar for this stub is at the position of maximum current where even a small loss resistance can result in a substantial power loss. In practice, a stub was made using bare copper wire for the preliminary tuning and once the correct position for the shorting bar had been established, an identical stub was bent from insulated wire and substituted. All wire joints were first made mechanically firm, soldered, wiped, then finally coated with lacquer. It is important that that the ends of the director wires have a soldered joint in the loop where they terminate at the last insulator. Further, if appreciable power is contemplated, that these ends should be rounded off so that no sharp points exist that might aid in starting corona.

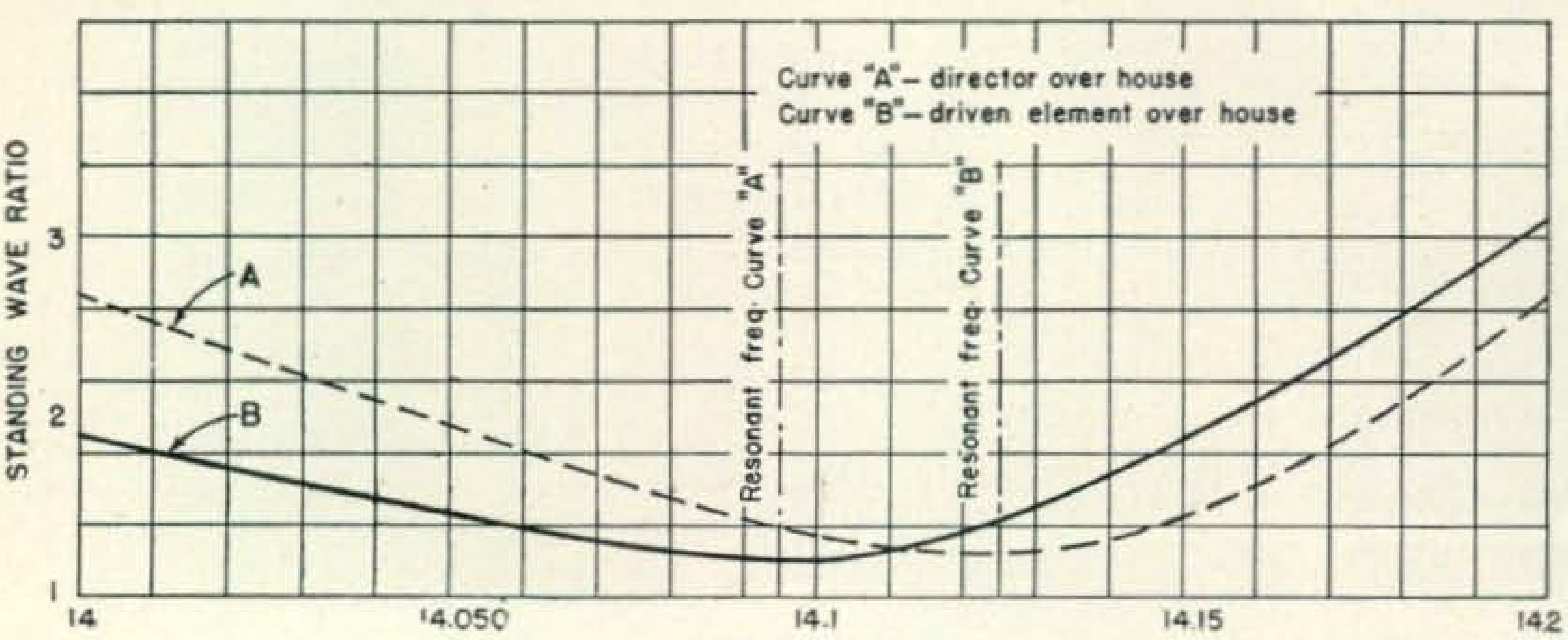
Tuning

Several attempts were made to tune the beam with the assistance of on-the-air stations. For the greater part these were not successful particularly as regards forward gain adjustments. If the maximum forward gain of the antenna is about 4 db and an S point on the receiver meter represents about 6 db (maybe), the *best* one could expect would be little more than half an S point change; hardly sufficient in view of changing line voltage and other parameters. It was finally decided to set up a field strength antenna as far removed from the beam as possible (about one wavelength in our case), and to run a long feed line from this antenna (to which a thermo-galvanometer could be connected). It is possible with this arrangement to excite the beam with the station transmitter (on very low power), and provide a sufficient meter reading for accurate results; the instrument being placed in direct sight of the person doing the tuning. Preliminary tests showed a discouraging lack of front-to-back ratio regardless of the adjustment of the parasitic element and was ultimately traced to a rather peculiar circumstance. This being a two element beam, the driven element does not mount at the center of the rotating shaft but is about six feet off center. Therefore, when the beam is set for back gain the driven element is twelve feet closer (twice its spacing from the center shaft) to the pickup antenna than when set for forward gain. With the pickup antenna only a wavelength removed from the beam, this twelve foot decrease in spacing can make a radical change in reading; a change which is unfortunately in the wrong direction as regards back-to-antenna readings.

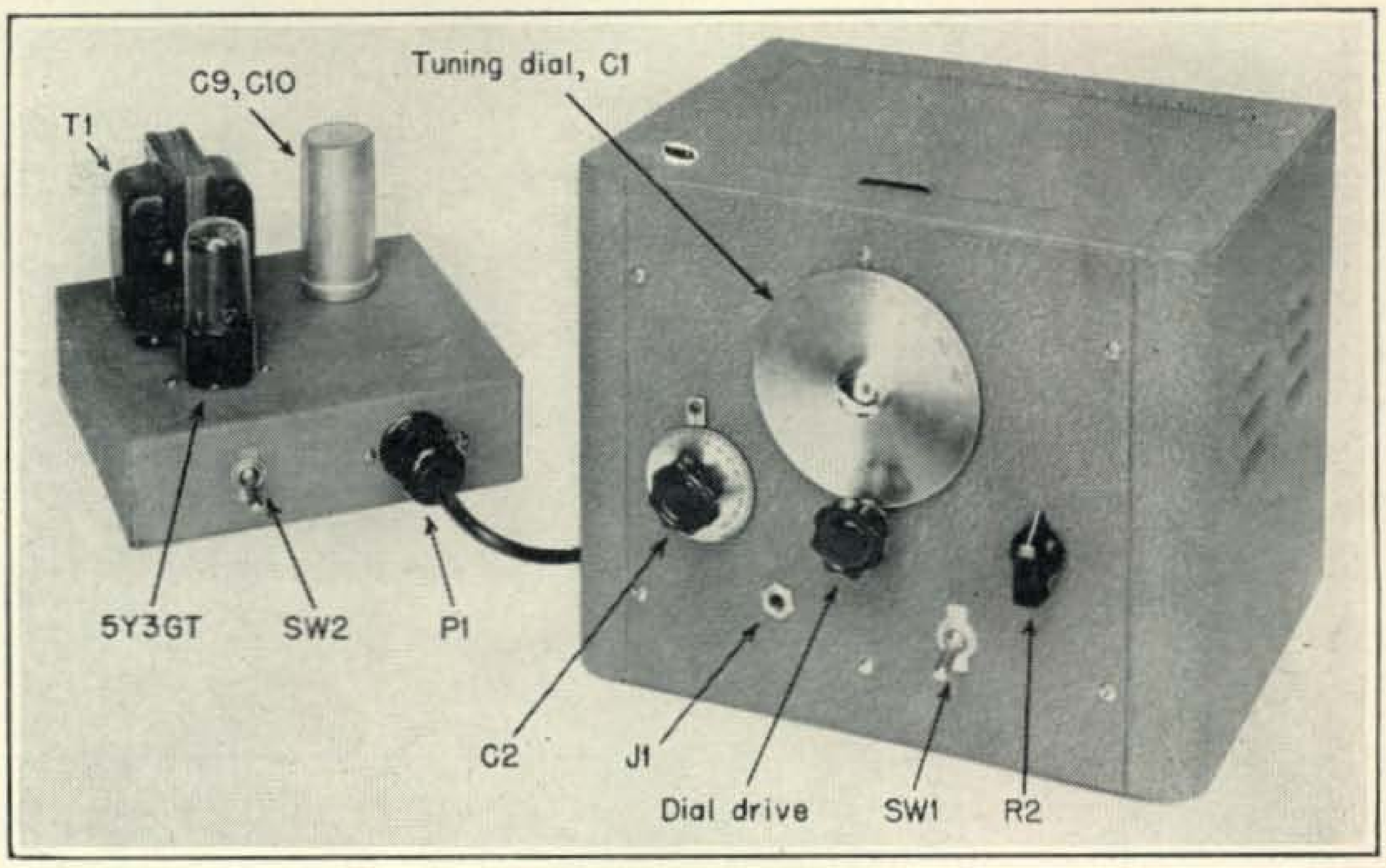
The problem was solved by taking readings on the driven element alone with the parasitic element open at the stub and subtracting the difference in readings so obtained with the antenna rotated 180 degrees. This correction factor was then applied when normal front-to-back meaurements were undertaken. The obvious correction would have been to move the pick-up antenna farther away so that the twelve foot differential in driven element spacing (to pick-up antenna), would be negligible in comparison to the total distance. In our case this was impossible without cloud hooks. Although tuning procedure is very conventional one or two comments may be helpful. At the start, open the stub in the parasitic element then put a small amount of power into the antenna (use very loose coupling to the final amplifier and make certain that the latter is carefully resonated). Solder a pair of heavy wires to a flashlight bulb and use this as the shorting bar on the stub of the parasitic element (an r-f ammeter can also be used). Slide the bridge along until the bulb passes *through* a definite maximum then return to the point of greatest lamp brilliancy. The final amplifier should then be re-resonated and this operation repeated. This position of maximum represents self-resonance of the parasitic element and assuming that the adjustment has been made at the frequency to which the beam is to be tuned, will give a definite check on whether or not the end loading on the parasitic element is sufficient to result in a small tuning stub. This self-resonant point makes the parasitic element a *reflector* (with one tenth spacing), and will result in a very substantial attenuation to the rear of the beam but very little forward gain. We found that this beam rather closely followed all theoretical predictions as to patterns and the maximum forward gain was achieved as a *director* as was to be expected. Again consistant with theory, a critical point can be located where the forward gain does not drop too badly but where the attenuation to the rear increases markedly.

In view of the fact that we would hardly ever be apt to operate on the exact frequency to which the beam was originally tuned, little attention was paid to this critical point and all adjustments were made for maximum forward gain. At this setting the measured gain of the beam was about 4 db over that of the driven element alone. We had previously checked this driven element against a

(*Continued on page 101*)



Curves showing S-W-R vs frequency for four-wire folded doublet working into a 300-ohm line (2-element beam). Note the change in S-W-R and shift in resonant frequency as either antenna or director are directly over a portion of the roof.



Front view of the two-tube regenerative receiver and its associated power supply. The operating controls are all placed at advantageous locations on the front panel. The slow-motion dial drive knob is elevated to a comfortable position above the table. The regeneration control is conveniently placed nearby and the stand-by switch is available for instant use.

A Modern Receiver for the Beginner

A. DAVID MIDDELTON, W1CA*

A communications receiver incorporating the latest miniature tubes and readily available plug-in transmitter type coils.

SINCE ULTIMATELY the majority of amateurs employ commercially manufactured receivers in their stations, the beginner is apt to look down his nose on a receiver designed specifically for him. But modern tube development makes it possible to construct a receiver that is not only simple, but amazingly efficient. This unit designed primarily for the new ham, or prospective amateur, may be built at a minimum of cost by anyone possessing almost no experience in radio construction. One of the most difficult tasks for the beginner, the construction of coils, has been completely eliminated by utilizing readily available low-priced plug-in transmitting units. Far from being a mere shop experiment, the Modern Receiver for the Beginner has been used successfully for amateur communications on 80, 40 and 20, the three most important bands for the new amateur.

This receiver consists of a 6AK5 pentode in an electron-coupled regenerative circuit, impedance-coupled to a 6C4 audio amplifier providing output for headphone operation. Plug-in coils provide general coverage as well as full bandspread on the 14, 7, and 3.5-mc amateur bands.

Two single-wire antenna connections are available, one for short antennas (3 to 10 feet) and one for longer antennas. The headphone jack, located at the lower left of the front panel is connected so that no direct current flows through the headphones, thus permitting the use of any type of high-impedance phones. A SEND-RECEIVE switch turns the receiver plate voltage on and off. It is connected so that when the receiver is "off," the associated transmitter (connected to the receiver by means of the two-prong male plug on the rear apron of the receiver) is "on." Similarly, when the receiver is "on" the transmitter is "off" or on "stand-by." A slow-motion dial permits accurate and smooth tuning of the bandspread condenser. Bandspread is provided by tapping the tuning condenser down on the coil. A front panel miniature dial permits easy and accurate adjustment of the band-set condenser on either general coverage or bandspread.

A separate 117-volt power supply, furnishing the required filament and plate voltages for the receiver, is contained on a 7" x 7" x 2" chassis. Connections between the receiver and power supply are furnished by a four-wire cable which terminates in a plug fitting into a socket on the front apron of the power supply chassis.

An a-c ON-OFF toggle switch on the front apron of the power supply controls the a-c input to supply, permitting the filaments of the receiver to remain heated during operating periods, with the plate voltage being turned on and off as desired.

Preparation of the Chassis

The chassis layout may be duplicated by following the placement of parts illustrated in the photographs. Exact dimensions are not given because position is not that critical. The position of the tube sockets to duplicate the wiring shown may be determined from the photos and by reference to the step-by-step wiring instructions. The bandspread

*23 *River Glen, Farmington, Conn.*

tuning condenser, *C1*, is located in the center of the panel, and the band-set condenser, *C2*, is located on the left side of the panel. The front panel should be drilled and then fastened to the chassis by means of *J1* and *SW1*, and a 6/32 screw located in the lower center of the panel. The layout will vary slightly depending upon the chassis and panel used, but the general placement of parts should be adhered to.

Wiring the Receiver

A. Ground *pin 3, S2*. Ground *pin 3, S3*. Ground *pin 4, S1*, with a soldering lug on top of the chassis as well as underneath, fastened by a screw holding one end of *S1*. Ground rotor (movable plates) of *C1* and *C2* to this top-chassis soldering lug. Ground tie-lug *B1*. Ground lug 2 on *R2* with long soldering lug provided with potentiometer, by slipping this lug over barrel on shaft before tightening down.

B. Connect *pin 4, S2*, and *pin 4, S3*, together (with insulated wire) and connect to lug *B3*.

C. Connect *pin 3, S1* to stator (stationary) plates *C1*. Connect *pin 2, S1* to stator plates, *C2*. Connect *C3* and *R1 in parallel*. Connect one end to *pin 1, S2* and connect other end to the wire running from *pin 2, S1* and *C2*. Connect *pin 1, S1* to *pin 2, S2*. Ground metal center post of *S2*. Ground *pin 4* and *5, S1*.

D. Connect *positive* lead *C7* to *pin 7, S3*. Ground *negative* lead, *C7*. Connect *R6* between *pin 7, S3* and ground. Connect *R5* between *pin 6, S3* and ground. Connect one end *R7* to *pin 5, S3* and other end *R7* to lug *C3*. Connect *C8* between *pin 5, S3* and *tip* connection *J1* (this is the lug on jack that is not grounded to frame of jack).

E. Connect lug *B4* to lug *AA* on *SW1*. Connect lug *CC* (center) *SW1* to lug *C1*. Connect lug *FF*, *SW1*, to one terminal *P1*. Connect lug *DD*, *SW1*, to other terminal *P1*.

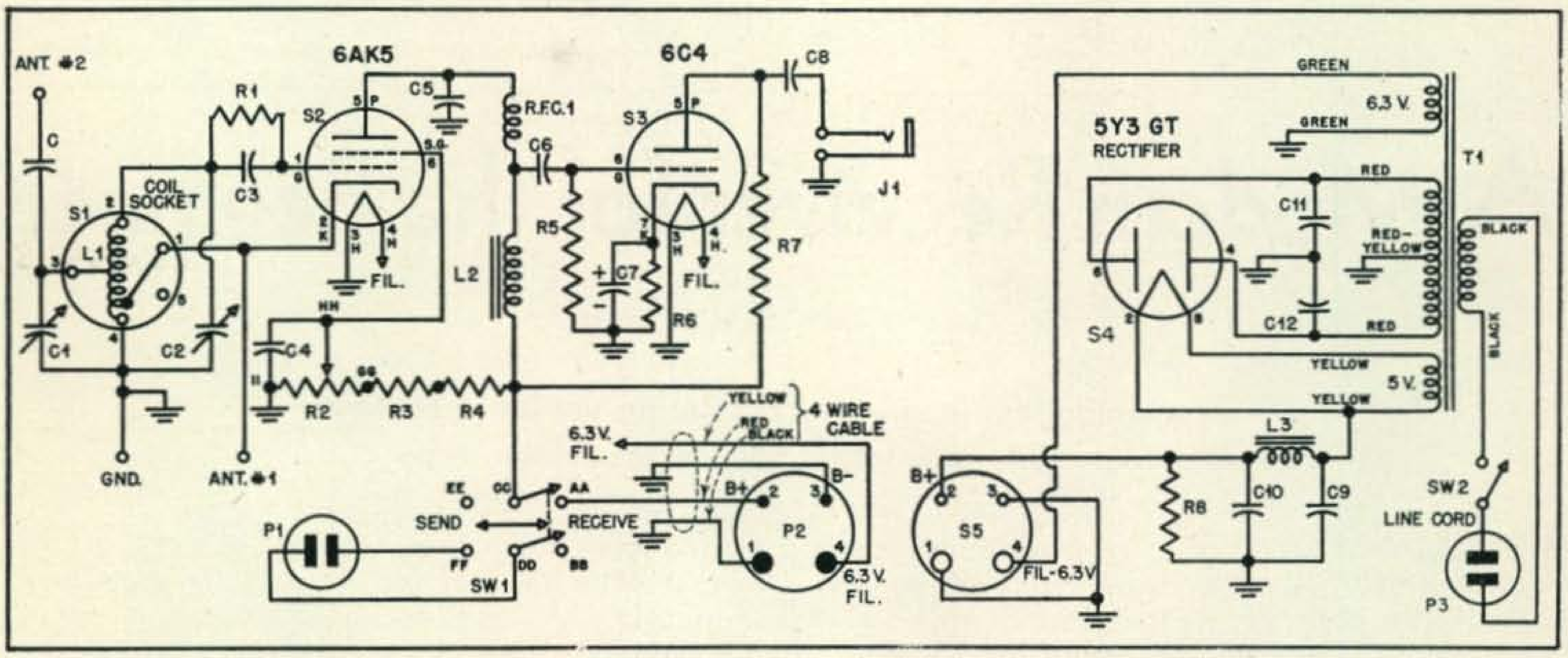
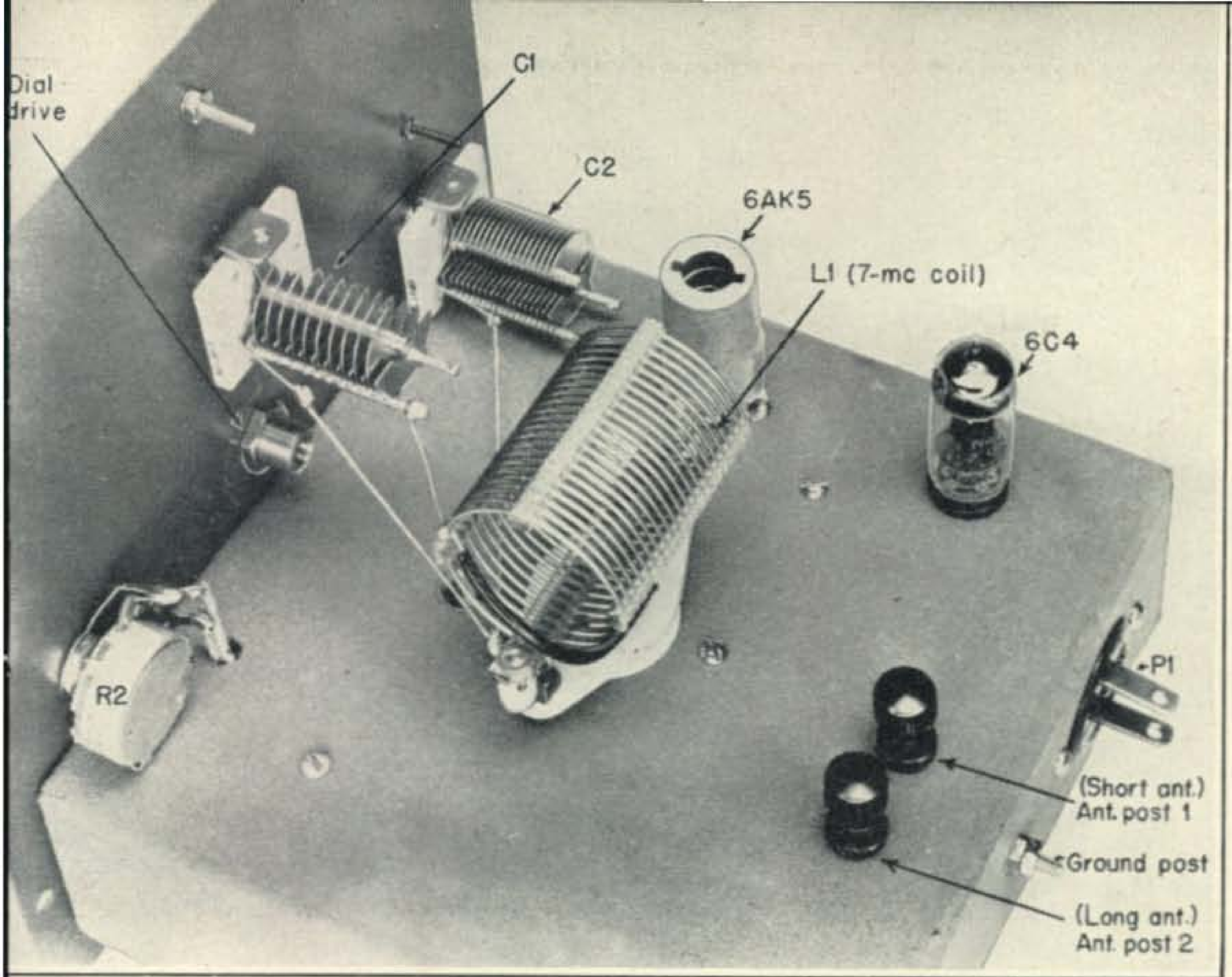


Fig. 1 (right). Schematic diagram of the 2-tube regenerative receiver.
Fig. 2 (left). Schematic of the 117-volt power supply.

R1—4.7 megohms, ¼ watt.
R2—50,000-ohm potentiometer, midget type.
R3, R4, R7—100,000 ohms, ½ watt.
R5—470,000 ohms, ½ watt.
R6—2,200 ohms, ½ watt.
R8—25,000 ohms, 10-watt, wire-wound.
C1—30-μμf midget variable (Hammarlund HF - 30 - X or equal). (Bandspread)
C2—140-μμf midget variable (Hammarlund HF-140 or equal). (Band set)
C3, C5—100-μμf midget ceramic (Centralab Hi Caps or equal).
C4—0.5 μf, 400 v., paper.
C6, C8—0.01 μf, paper.
C7—10 μf, 25 v., electrolytic, midget.
C9, C10—40 μf, 450 v., dual, in metal can.
C11, C12—0.002 μf, 600-volt mica.
L1—5-prong 75-watt transmitting-type coils, modified (See text).
L2—10-hy "a.c-d.c." filter choke @ 55 ma, 350 ohms d-c resistance.
T1—Power transformer, 500 volts. c.t., 5v. @ 2 amp, 6.3 v. @ 2 amp.
P1—Male chassis plug (Amphenol 16M1).
P2—Male cable plug, 4-prong (Amphenol).
P3—Male plug, on a-c line cord.
S1—5 - prong socket, ceramic (Millen 33005 or equal).
S2—7-prong socket, miniature, ceramic, and shield for 6AK5 tube (Johnson 277B).
S3—7-prong socket, miniature, bakelite. (Amphenol RS7S).
S4—8 - prong socket, bakelite (Amphenol RS8).
S5—4 - prong socket, bakelite.
RFC1—2.5-mh. r-f choke.
SW1—DPDT toggle switch.
SW2—SPST toggle switch.
J1—Jack, open circuit, midget type.
2 Chassis, 7" x 7" x 2" (1 each for r-f unit, and power supply).
1 Cabinet, 10" x 8" x 8".
1 Dial, 3½" (National, Type K, with dial drive and pointer).
1 Dial, 1¾" (calibrated 0—100) pointer.
1 Knob, pointer, for ¼" shaft (Bud K-580 or equal).
1 8-point tie-lug strip.
1 6-point tie-lug strip.
1 4-point tie-lug strip.
2 ½" bushings, metal, threaded both ends, 6-32.
20 Machine screws, 6/36 x ½", brass.
4 Machine screws, 6/32 x ¼", brass.
21 Nuts, hexagon, 6/32 thread.
2 Machine screws, 4/32 x ¼", brass.
2 Nuts, hexagon, 4/36 thread.
2 Grommet ½ I.D.
2 Binding posts, insulated, with fibre bushings.
4 feet four-wire battery cable.
1 A-C line cord with plug (or 5-feet two-wire lamp cord).
Soldering lugs, for 6/32 screws.
1 plug, single circuit, headphone type.
1 pair headphones, crystal or high-impedance type.
5 feet No. 20 push-back wire.
1 ft. spaghetti.



Inside shot showing the heart of the receiver—the r-f tuning components. The plug-in coil, L1, is a modified transmitting type. The cathode tap on the coil is made about one-quarter turn from the ground end. The coil shown covers the 7-mc amateur band and provides adjacent general coverage. Note the wire leads connecting the rotor (rotary plates) of band-spread and band-set condensers, C1 and C2. These wires connect to a soldering lug on top of the chassis. A machine screw through the chassis holds this lug and all r-f ground connections to the coil and detector circuit are made to this common point. Thus the metal panel and chassis are not depended upon to complete any r-f circuits. Leads to stators (fixed plates of C1 and C2) run through large holes to their connections on S1.

F. Connect *R3* in series with *R4* and connect between lugs, *A1* and *A4*. Connect lug *A1* to *C1*. Connect lug *GG*, *R2*, to lug *A4*. Connect lug *HH*, *R2*, to lug *A2*. Connect one end *C4* to lug *A2* and ground other end *C4*. Connect lug *A2* to *pin 6, S2*.

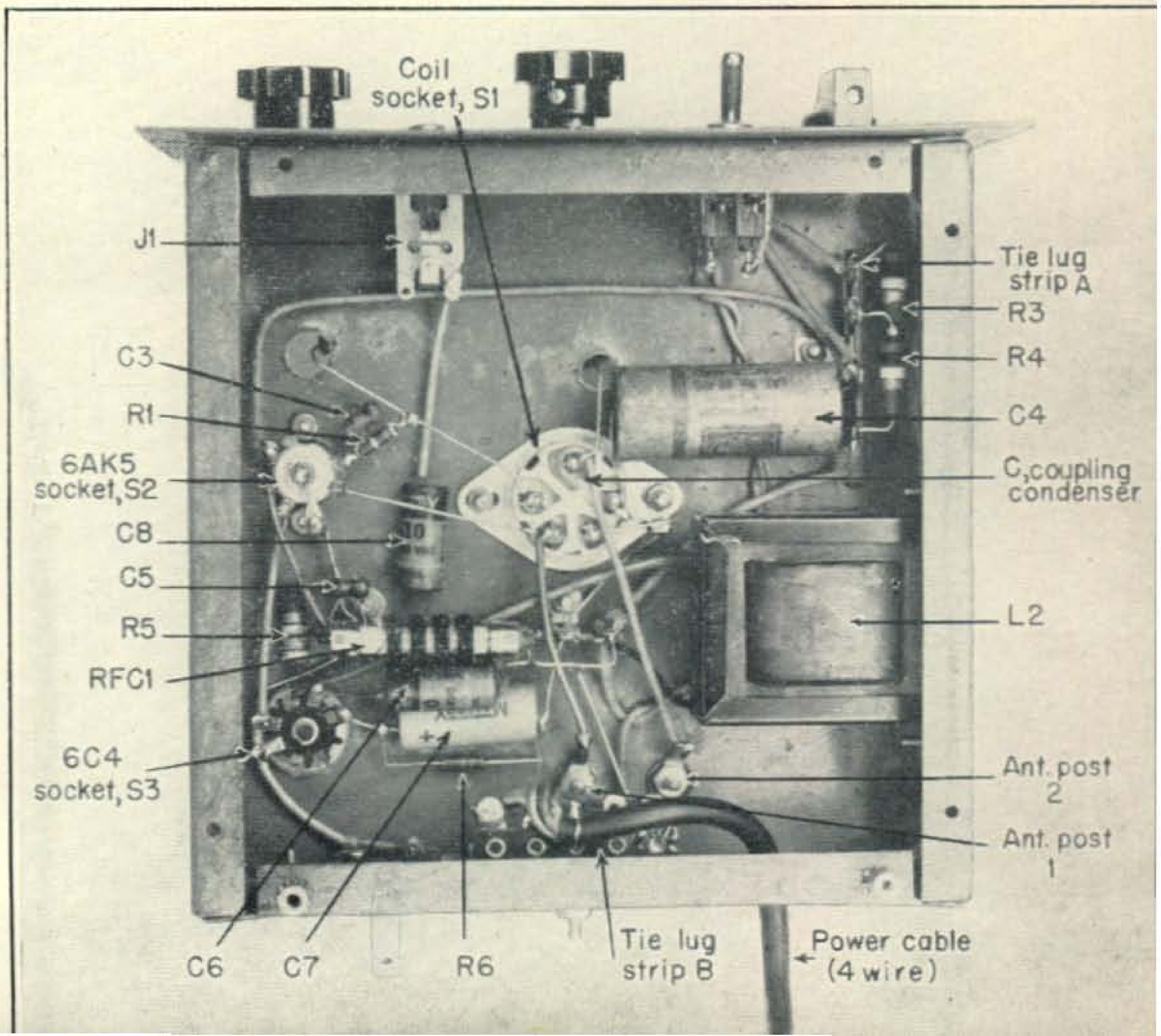
G. Connect one end *RFC1* to lug *C8* and other end to lug *A4*. Connect *C5* between *pin 5, S2* and ground. Connect *pin 5, S2* to lug *C8*. Connect one end *C6* to lug *A4* and other end to *pin 6, S3*. Connect one lead *L2* to lug *A4* and other lead, *L2* to lug *A1*.

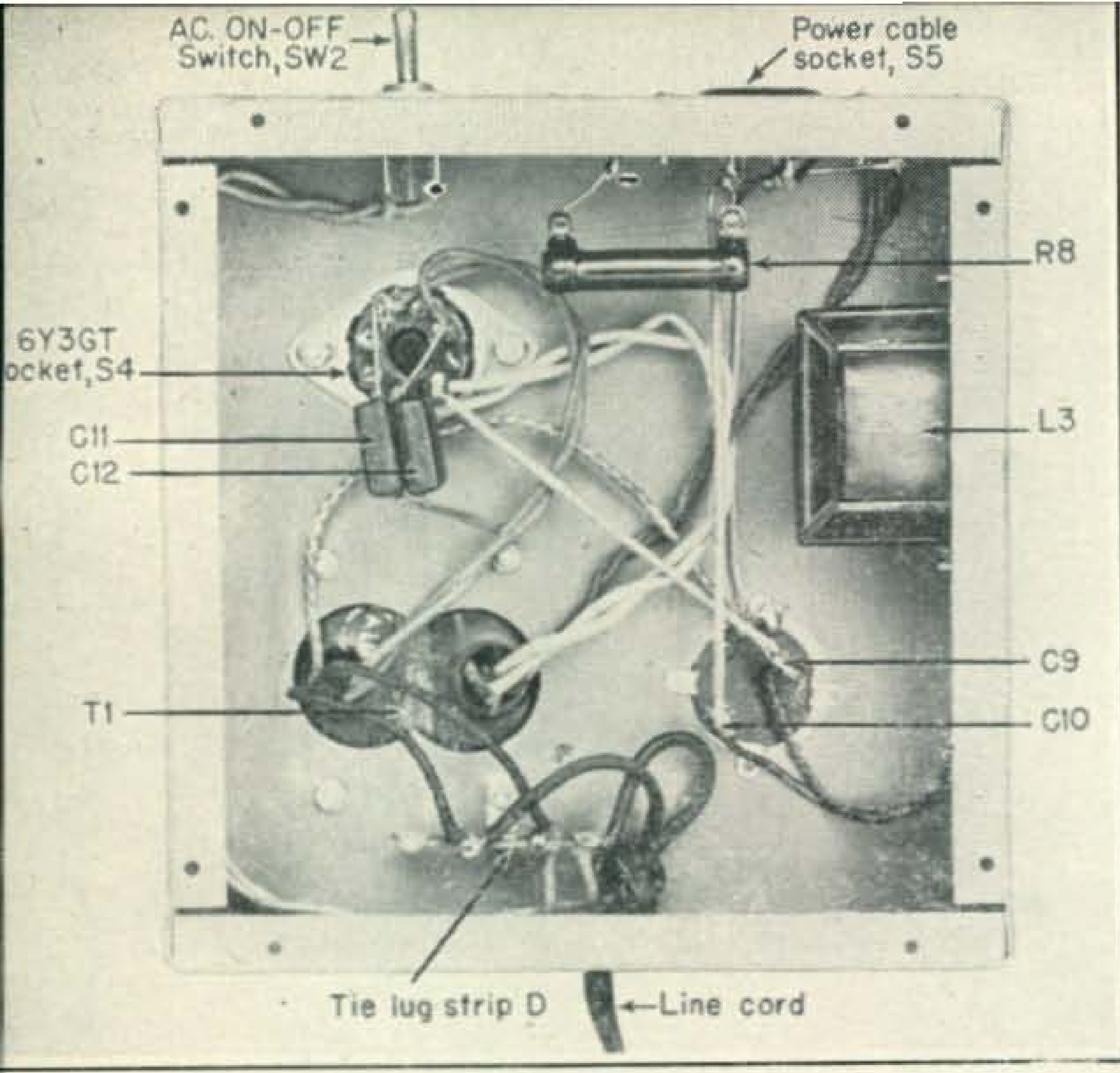
H. Connect *antenna post 1* to *pin 1, S1*. Connect piece of insulated wire to *antenna post 2* and run this wire over to make one turn (insulated) around *pin 3, S1*. This inserts a very small capacity between the antenna post and the stator of *C2*.

The Power Supply

Mount the components on the power supply chassis as shown in the photographs. The power transformer, *T1*, is placed so that the filament (green and yellow leads) come through the chassis toward the center. Mount the metal can *C9* and *C10*, by bending and crimping the lugs around the hole in the chassis. Fasten a four-terminal tie lug strip on the rear center machine screw holding *T1* to the chassis. Pull the line cord through the grommetted hole in the rear apron and tie a knot in the cord allowing about 3″ to extend inside the chassis. The rectifier tube socket, *S4*, is mounted with the key towards the center of the chassis. The power cable socket, *S5*, is mounted with the key towards

Under-the-chassis view of the two-tube receiver. The components are all placed in the open with the exception of the 6C4 plate load resistor, R7, which is beneath RFC1, and not visible in the photograph. Holes drilled through the chassis permit direct leads to be run from C1 and C2 to the coil socket, S1. Note the coupling condenser C, formed by twisting one turn of insulated wire around pin 3, S1. This lead runs to antenna post 2, to which long antennas may be connected. Antenna post 1 connects to pin 1, S1, the cathode connection on the coil. Plate choke, L2, is mounted on the inside of the right apron of the chassis.





Underneath-view of the power supply chassis. Filter choke L3 is fastened to the inside of the right apron of the chassis. The two terminals of filter condensers, C9 and C10, protrude through the socket hole. The ground connection to the metal can of C9 and C10 is made to one of the turned-down ears on the can. Four of these ears are bent over to hold the condenser in place in the punched socket hole.

the right side of the chassis. Mount the choke *L3* as shown in the photographs.

Wiring the Power Supply

A. Connect one lead of the line cord to tie lug *D1* and the other lead to lug *D3*. Connect lug *D1* to one terminal of *SW2*. Connect other terminal *SW2* to lug *D2*. Connect one primary (black) lead *T1* to lug *D2* and connect the other black lead to lug *D3*.

B. Ground the high-voltage center tap (red-yellow lead) *T1*. Ground one lug of the can of *C9*, *C10*. Ground *pins 1* and *3* of *S5*.

C. Connect one high-voltage (red) lead, *T1*, to *pin 4 S4*. Connect other red lead *T1* to *pin 6*, *S4*. Connect one 5-volt filament (yellow lead) *T1* to *pin 2*, *S4*. Connect other yellow lead to *pin 8*, *S4*.

D. Connect one 6.3-volt filament (green lead) to *pin 4*, *S5* and ground other green lead, *T1*.

E. Connect one lead of *L3* to one lug of *C9-C10* (center lug terminal) and connect other leads of *L3* to other lug of *C9-C10*. Connect one center terminal *C9-10* to *pin 8*, *S4*. Connect other center terminal *C9-C10* to *pin 3*, *S5*. Connect *R8* between *pin 3*, *S5* and ground.

F. Connect *C11* between *pin 6*, *S2* and ground. Connect *C12* between *pin 4*, *S2* and ground.

Coils for the Receiver

One of the greatest handicaps to the beginner building a receiver is the fabrication of the coils. The simplified procedure suggested will provide excellent coils with a minimum of trouble and at very low cost.

Barker and Williamson JEL-type low-powered transmitting coils were modified by the removal of a link and the addition of two simple taps. These coils, known as "B & W Junior coils," are the end-linked (JEL) variety.

Remove the end link on each of the coils by un-unsoldering the leads in *pins 1* and *5*. Cut the wires and insert a thin knife blade or a razor blade between the insulating block of the link and the coil and pry the link off.

The 14-mc Band Coil

Solder a piece of insulated wire to *pin 1* and connect it so that it taps onto the coil about one-quarter of a turn from the *ground end* (*pin 4*). This provides the cathode tap.

Connect a piece of wire to *pin 3*. Connect it to the fourth full turn from the *ground end*. This is the "bandspread tap" and permits *C1* to be tapped down on the coil.

The 7-mc Band Coil

Make the cathode tap in the same manner as on the 14-mc coil except that the tap is moved around slightly to include a bit more than one-quarter of a turn from the ground end, *pin 4*. The bandspread tap is placed nine full turns from thr ground, and connects to *pin 3* on the coil base.

The 3.5-mc Band Coil

Make a cathode tap *one* turn from the *ground* end. This can best be done in this close-spaced coil by inserting the point of a knife blade between the turns and prying the desired spot on the wire outward so that a tap can be soldered to it.

Place the bandspread tap *27 turns* from the *ground* end. This amount of bandspread will place the 3.5-mc c-w band on the dial—and a small portion of the 3.85-mc phone band. To cover the 75-meter phone band, the capacity of the band-set condenser is lowered slightly, thus bringing the phone band onto the dial.

Testing the Two-Tube Receiver

The first tests should be made on the power supply and the following sequence should prove helpful:

A. Inspect and check all of the power supply wiring for correctness and to make sure that it corresponds to *Fig. 2* and to the wiring proceedure.

B. Throw *SW2* to the "off" (down) position. With the receiver power cable unplugged and without the 5Y3GT rectifier tube in its socket, plug the a-c line cord into a fused 117-volt outlet. Throw *SW2* to "on." This will close the 117-volt input circuit. With a 0-10 a-c voltmeter (or a 6-volt pilot lamp substitute) check between *pins 4* and *1*, *S5*. There should be approximately 6 volts present on the meter (or the pilot bulb should burn normally).

C. Turn off *SW2*. Replace the 5Y3GT in its socket. Operate *SW2* and observe if the rectifier tube glows. Do not proceed further until the rectifier filament voltage is obtained and satisfactory 6.3-volt filament output is obtained on the power socket, *S5*. Turn off the a-c input.

D. If the filament circuits are correct, proceed with the high-voltage tests. From this point on there will be the constant presence of a high voltage whenever *SW2* is on. While 300 volts or so might not harm you, it pays to be on the alert against *any* possible danger of electrical shock.

E. Connect a 0-500 d-c voltmeter between *pin 2*, *S5* and ground, with the *positive* lead of the meter to *pin 2*. Operate *SW2* to "on." After a few seconds the meter should read approximately 275 volts. If no suitable high-voltage meter is available, place three small 117-volt bulbs in series and use this in lieu of a voltmeter. If no high voltage is present, turn off the power supply, and recheck the wiring. The rectifier tube might be defective. One or both of the filter condensers might be shorted, and if so, the rectifier tube will get hot

(*Continued on page 98*)

Selsyn Beam Rotator

C. V. HAYES, W6RTP*

Selsyns, widely available through surplus channels, may be successfully employed to rotate lightweight beams.

Fig. 3. Closeup of the receiver Selsyn motor used to rotate the entire beam. The motor is mounted vertically and the top bearing serves to support the array. The coax cable is fed through the supporting steel tubing and sufficient slack is left at the bottom to allow two complete rotations. The numbers indicate the five parallel hookup wires.

UNDOUBTEDLY, every amateur has noted the large number of Selsyns in the war surplus market. This has been coupled with a gradual decline in the price of these units until many amateurs wonder if they can not be used to rotate as well as indicate our beam antennas. Since a number of Selsyns were used for heavy duty applications (gun fire control, etc.) the answer to this question is—yes.

These heavy duty Selsyns may be distinguished from their weaker brothers by their model classification—5G or larger. We have successfully rotated our vertically polarized beam—as well as a four-element 10-meter array with a 7G model Selsyn.

For the benefit of those who are not thoroughly familiar with Selsyns, a bit of explanation may be in order. The Selsyn is a trade name, like the Telegon, Autosyn, etc. It is a synchronous motor wired in such a fashion that when two of them are connected in parallel the induced currents in the delta connected stator windings of one will be transferred to the other. This creates a phasing action and the Selsyns will then tend to follow each other. Generally, one Selsyn is designated as the *transmitter* and the other as a *receiver*. The nominal arrangement for wiring up two Selsyns is shown in *Fig. 1*. The proper relationship is maintained by careful wiring and seeing that all like terminals are connected together.

**Rt. 2, Box 84, Elsinore, Calif.*

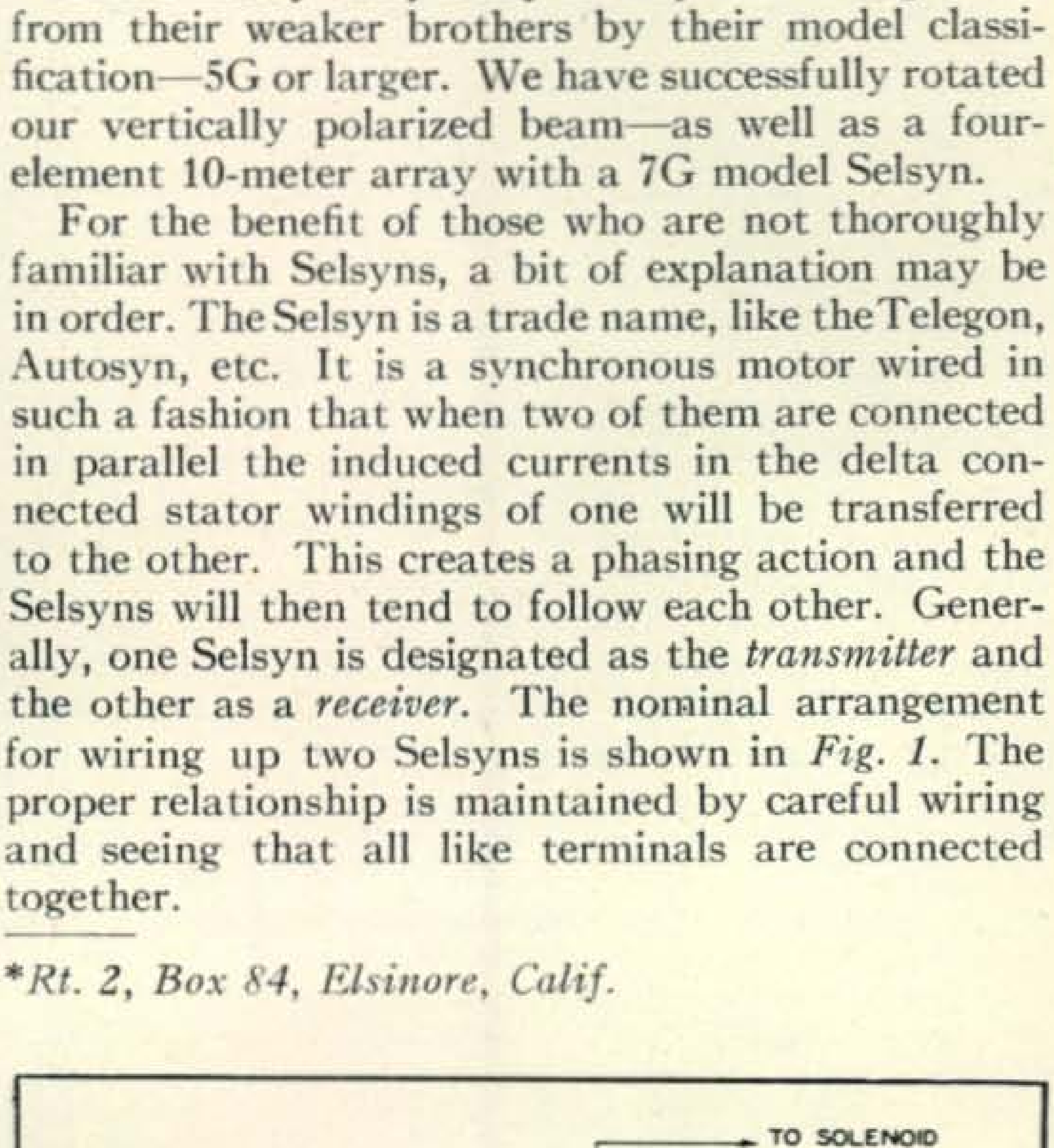


Fig. 1. Selsyns are normally wired in parallel. The a-c voltage is applied only to the rotors. In the method rotating the beam described by W6RTP it is necessary to incorporate a solenoid type brake to stop the beam from rotating in the wind. This is wired into the Selsyn circuit to release the rotating member when the Selsyns are energized.

In most Selsyns the line voltage is applied only to the rotors. This is important. Often it is best to check with an ohmmeter to make sure you have the rotor windings before connecting in the line voltage. After paralleling the two units completely, and applying the correct a-c voltage to the rotors, it will be found that turning either rotor shaft will result in the other shaft following around in the same direction. Incidentally, be sure that there is some sort of lock-pressure exerted on one of the Selsyn shafts. Because they are both synchronous motors the rotation of one of the shafts when no lock-pressure is applied to either will result in their winding-up and taking off like a pair of high-speed motors.

Mounting to Rotate the Beam

The mounting scheme used by the author is illustrated in the accompanying photos and diagrams. Any similar scheme will probably work quite as well—although this one has been developed through trial and error and should be practically bug-proof.

If the Bendix-type Selsyns are purchased and are to be used to rotate the beam, it will be necessary to remove the circular butt-plate affixed to the shaft of one of the units. This is taken off by loosening the nut and slipping it from the keyed shaft. Two light punch pricks are made equidistant from the center of the butt-plate and about $2^1/_2''$ apart. These are then drilled out to pass a 10-32 bolt. Now procure a conduit strap of the $1^1/_2''$ type and mount it on the butt-plate with the 10-32 bolts and

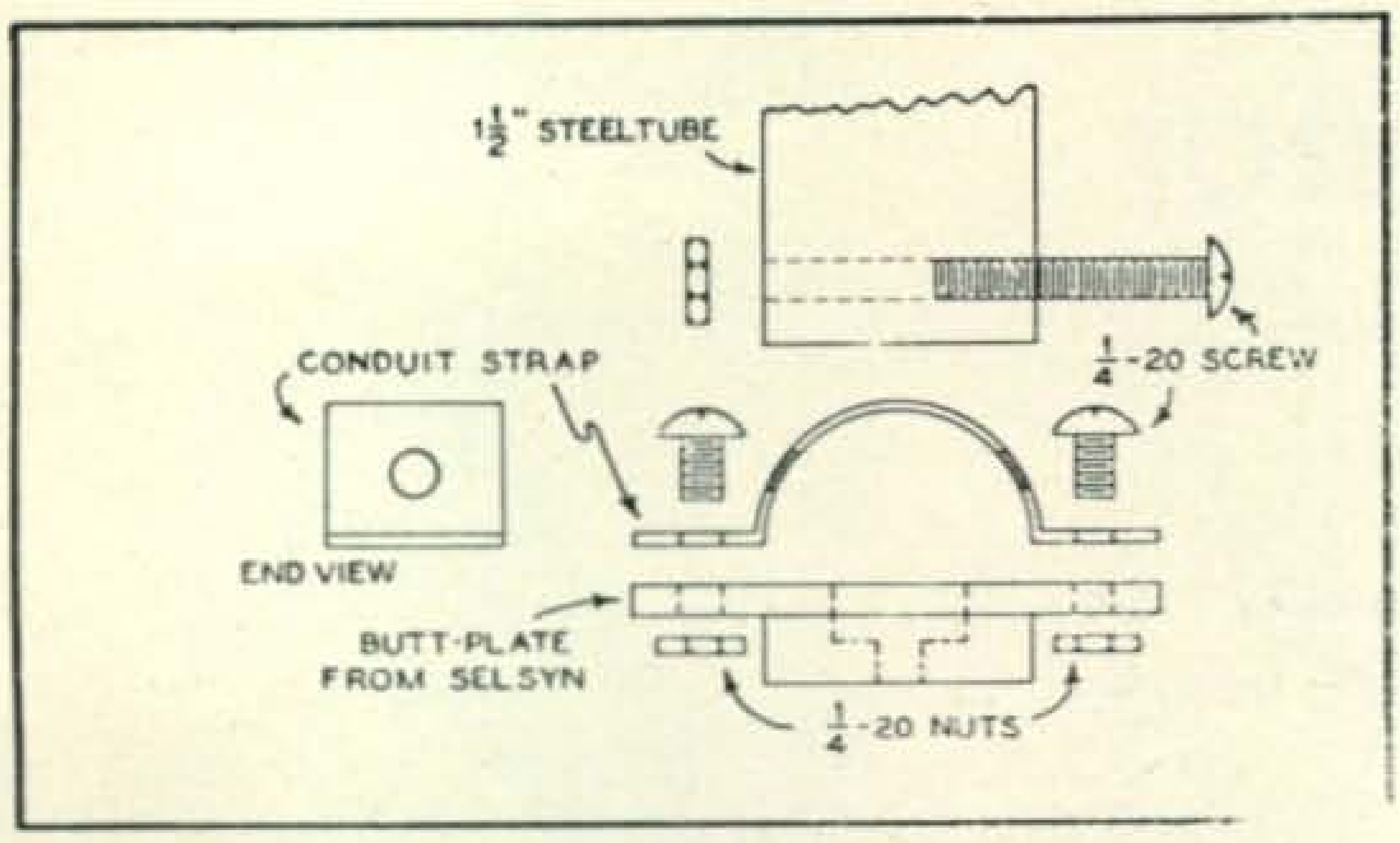


Fig. 2. To hold the base of the steeltube in place a fitting is designed from the butt plate of the Selsyn and a ½" conduit strap.

nuts. As shown in *Fig. 2* make a ¼" drill hole straight through the two sides of the conduit strap—that is, through the sides of the "U." This portion of the strap is then forced inside of 1½" steel tube which is used to support the beam antenna. Two appropriate holes are drilled through the steel tube and a ¼-20 bras is bolts passed through the steel tube and conduit strap making a secure base plate for the rotating member.

The next step is to remove the heavy bracket at the end of the Selsyn which is to be used as the transmitter. With certain Selsyns this bracket should be the correct diameter to slip down over the length of steel tube. The bracket may then be mounted on a 2x4 in such a fashion that it may be used as the upper bearing for the steel tube. This is shown to best advantage to *Fig. 3*. With the Selsyn mounted vertically and the steel tube set in place, you will have an extremely strong and rigid, but at the same time free-turning, mount.

The transmitting Selsyn is mounted on the most convenient spot on the top or side of the desk. If another mounting bracket is necessary, one may be bent out of heavy aluminum. Take off the butt-plate and discard. In its place substitute a heavy-duty shaft coupler or worm gear. Quarter-inch shafting should be provided to permit the control knob to be located at a handy spot. Some type of

(Continued on page 103)

V-H-F Fading

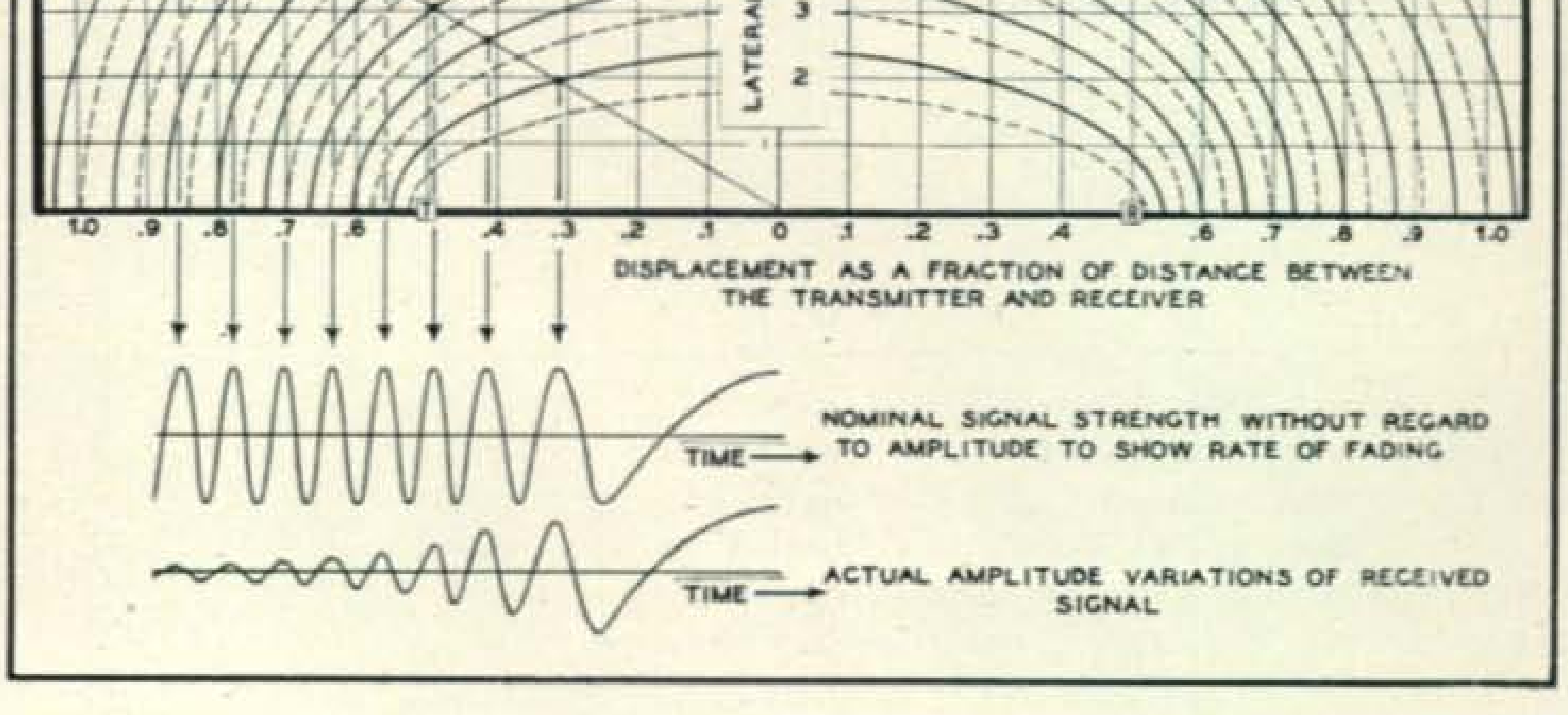
ALMOST EVERY OPERATOR who uses 10, 6 or 2 meters has at one time or another noted the scintillating fade. If aircraft are in the vicinity this type of fading occurs quite frequently during ground wave contacts. The effect is a rhythmic variation of the signal intensity coincident with a steady change in the tempo. Apparently the intensity of the fade is greater when the aircraft is flying along an extension of the vertical plane between the two stations. It is greatest when the aircraft is passing over either station or between the two stations.

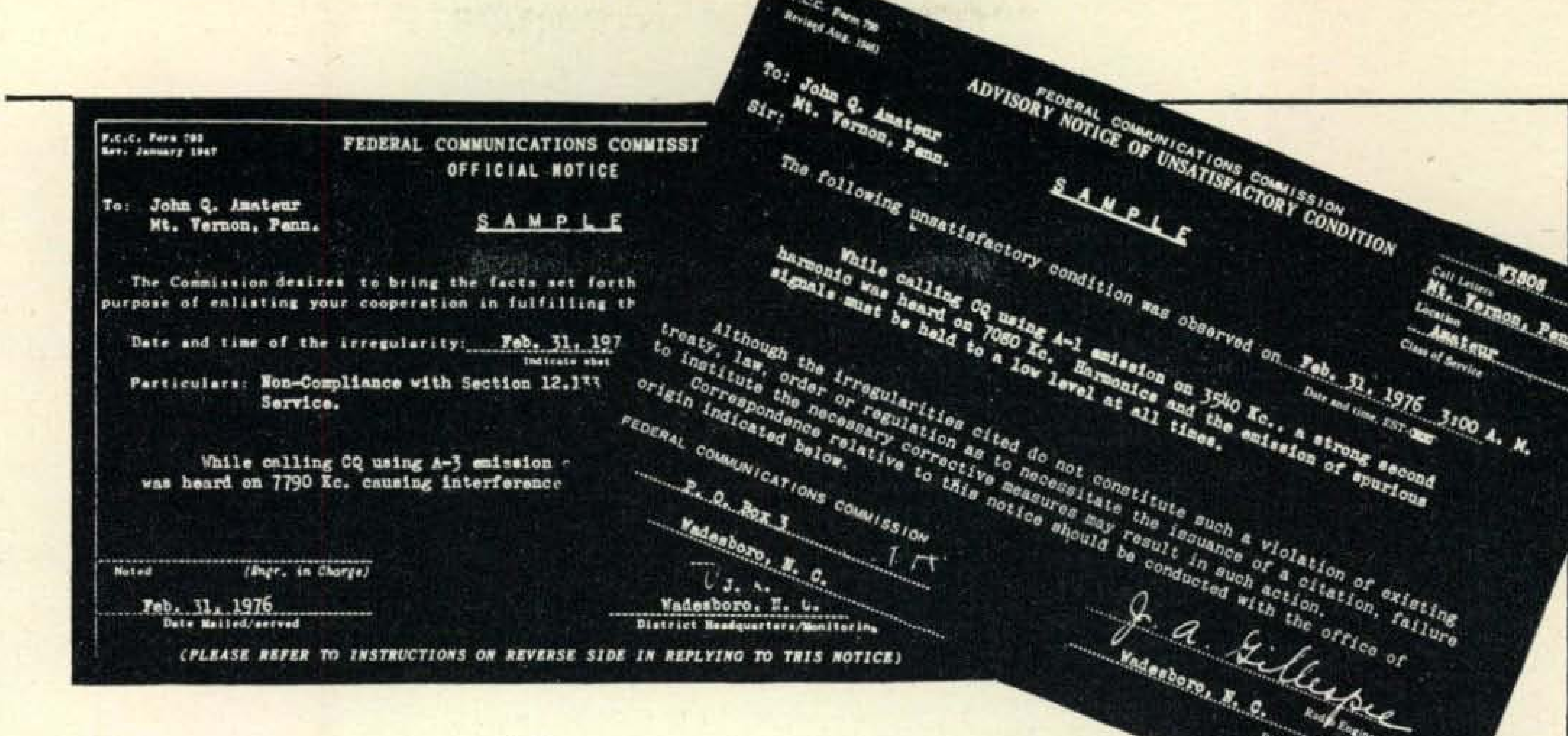
A fade of this type is an elementary example of in-phase and out-phase signal components. In a ground wave v-h-f contact there is normally only the direct ray between the two stations. When an aircraft enters the vicinity of either station there is formed an additional ray over an indirect path. This is the path from the transmitter to the aircraft and then to the receiver. As the indirect ray travels a greater distance it arrives at the receiver in varying phase combinations with the direct ray. These phase variations are changing continuously as the reflecting surface (the aircraft) is in motion. Thus, cancellation or reinforcement of the signal intensity occurs as the aircraft moves along.

J. W. Whitehead (*Wireless Engineer*, Jan., 1947, page 29) recently analyzed this effect and plotted a graph showing the displacement of the aircraft relative to both the receiver and the transmitter. The accompanying figure illustrates a nominal flight between v-h-f transmitter (*T*) and receiver (*R*). The confocae ellipses show the loci of the positions of maximum signal reinforcement (solid lines) and maximum signal attenuation (dashed lines). The scale of lateral displacement is in wavelengths and should be extended for much greater distances than can be shown in this graph.

The aircraft flight is represented by the line *AO*. As it enters the radiation field from the upper left corner it passes through the lines of signal reinforcement and cancellation. The rate of fading is drawn without regard to the extent of signal strength in the sine curves at the bottom of the illustration. A second set of sine curves shows what the actual signal variation would look like. Note the high maximum which is reached as the aircraft passes directly between the transmitter and the receiver.

By extending this set of ellipses and drawing other lines representing the flights of aircraft it is possible to reproduce the conditions expected when the planes fly parallel to, or at right angles to, the direct ray The most rapid scintillating fade will be produced when the aircraft crosses perpendicular to this pattern. —*O.P.F.*




F.C.C. Form 793
Rev. January 1947

FEDERAL COMMUNICATIONS COMMISSI
OFFICIAL NOTICE

To: John Q. Amateur
Mt. Vernon, Penn.

SAMPLE

The Commission desires to bring the facts set forth
purpose of enlisting your cooperation in fulfilling th

Date and time of the irregularity: Feb. 31, 197

Particulars: Non-Compliance with Section 12.133
Service.

While calling CQ using A-3 emission
was heard on 7790 Kc. causing interference

Noted (Engr. in Charge)

Feb. 31, 1976
Date Mailed/served

Wadesboro, N. C.
District Headquarters/Monitoring

(PLEASE REFER TO INSTRUCTIONS ON REVERSE SIDE IN REPLYING TO THIS NOTICE)

F.C.C. Form 790
Revised Aug. 1940

FEDERAL COMMUNICATIONS COMMISSION
ADVISORY NOTICE OF UNSATISFACTORY CONDITION

To: John Q. Amateur
Mt. Vernon, Penn.
Sir:

SAMPLE

W3SOS
Mt. Vernon, Penn.
Amateur

The following unsatisfactory condition was observed on Feb. 31, 1976 3:00 A. M.

While calling CQ using A-1 emission on 3540 Kc., a strong second harmonic was heard on 7080 Kc. Harmonics and the emission of spurious signals must be held to a low level at all times.

Although the irregularities cited do not constitute such a violation of existing treaty, law, order or regulation as to necessitate the issuance of a citation, failure to institute the necessary corrective measures may result in such action. Correspondence relative to this notice should be conducted with the office of origin indicated below.

FEDERAL COMMUNICATIONS COMMISSION
P. O. Box 3
Wadesboro, N. C.

J. A. Gillespie
Wadesboro, N. C.
District Headquarters

Down with Harmonics!

JAMES H. OWENS, W2FTW*

Even-order harmonics in push-pull amplifiers.

Doing a bit of eavesdropping on the band the other night, I heard this chance remark, "Don't use a single-ended final. It generates too much second harmonic. Put two tubes in push-pull, and the even harmonics cancel out." Right off the shovel, all this free advice. Oh, brother!

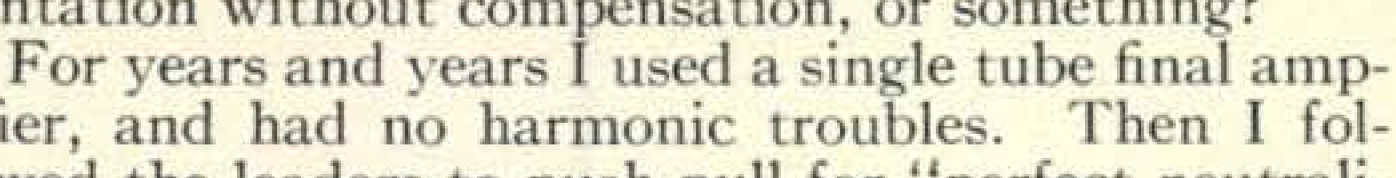
I almost fell out of my seat. Me, who just a few weeks ago got a ticket for second harmonic radiation from my lower-power push-pull final amplifier, sitting there listening to another ham being taken to the slaughter. Isn't there a law against misrepresentation without compensation, or something?

For years and years I used a single tube final amplifier, and had no harmonic troubles. Then I followed-the-leaders to push-pull for "perfect neutralization and balanced operation." But ignorance is not bliss very long in ham radio, with those F.C.C. monitoring boys on the job.

". . . . . . even harmonics cancel out." That statement is a half-truth that applies to Class A audio amplifiers. Even there the effect is limited by the degree of coupling between the output transformer windings. Besides, the two output tubes must have identical characteristics, and other circuit balance requirements have to be fulfilled.

In Class C r-f amplifiers, the axiom does not apply at all. In fact, a push-pull stage is apt to develop far more second harmonic than a single ended stage. This phenonema has been recognized in the past, but the underlying reasons have remained obscure. Now, at least one of them is to be unveiled.

First, it is necessary to review for comparison the action that takes place in a single-ended amplifier. The tube is biased beyond cutoff. Once each cycle, the preceding driver stage forces the control grid positive into the region of plate current conduction. The plate current pulses look like this:

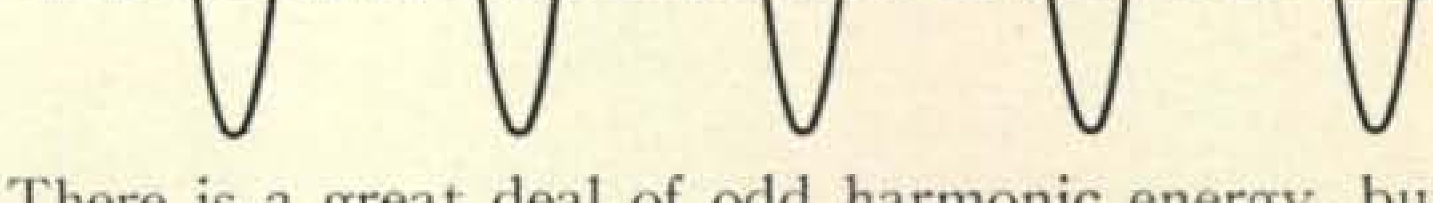


Of course, there is quite a lot of second harmonic energy in the illustrated waveform. However, the current pulses develop an r-f voltage in a tank circuit that usually has a "Q" of ten or more, which simply means that there is ten or more times as much energy in the flywheel than is being taken out of it. The result is a waveform having so little second harmonic that its detection is difficult.

On casual examination, a push-pull amplifier actually seems to be an improvement over this. The tank receives a pulse of plate current for each half-cycle, in other words it gets "full-wave" excitation. The tube current waveform, as seen by the tank circuit, looks like this:

There is a great deal of odd harmonic energy, but very little even harmonic energy in this waveform. After it is smoothed out by the tank flywheel, the even order harmonics practically disappear. So the axiom ". . .   . . . even harmonics cancel out" might be true, were it not for two interfering factors, i.e., series impedance common to both tubes, and the two pulses of plate current.

The common series impedance is made up of any part of the circuit through which *both plate current pulses flow in the same manner and direction.* The tube current waveform, through the common series impedance, looks like this:



Note that there are *twice* as many pulses as there were in the single tube amplifier. Frequency doubling? Yes, in fact the action is the same as that in a high-efficiency push-push doubler, where the grids are in push-pull, and the plates are in parallel. Here is real high power second harmonic energy. And it is not located where it can be filtered out by the tank flywheel.

(*Continued on page 100*)

*6931 Harvey, Merchantville, N. J.

The Amateur Newcomer

HOWARD A. BOWMAN, W6QIR, and WILLIAM A. GODDARD, W6AKQ

Radio-frequency oscillators and amplifiers.

THE AVERAGE HAM, if there be such a person, probably spends more of his time experimenting with radio-frequency (r-f) oscillators and amplifiers than he does with any other apparatus. The reason is obvious: it is by means of these units that he establishes communication with others. It has long been common practice for hams to buy their receivers but to build their transmitters. Not only does the F.C.C. demand a knowledge of radio-frequency generation and amplification before it will issue a license, but this knowledge is of the greatest practical value to the amateur.

It is well to point out here that circuits for the generation of r-f waves are used not only in radio transmitters, but also in a multitude of other applications. Industry makes widespread use of such apparatus for heating; medicine makes use of it for healing; and in countless other fields the r-f generator finds each year a large number of new applications.

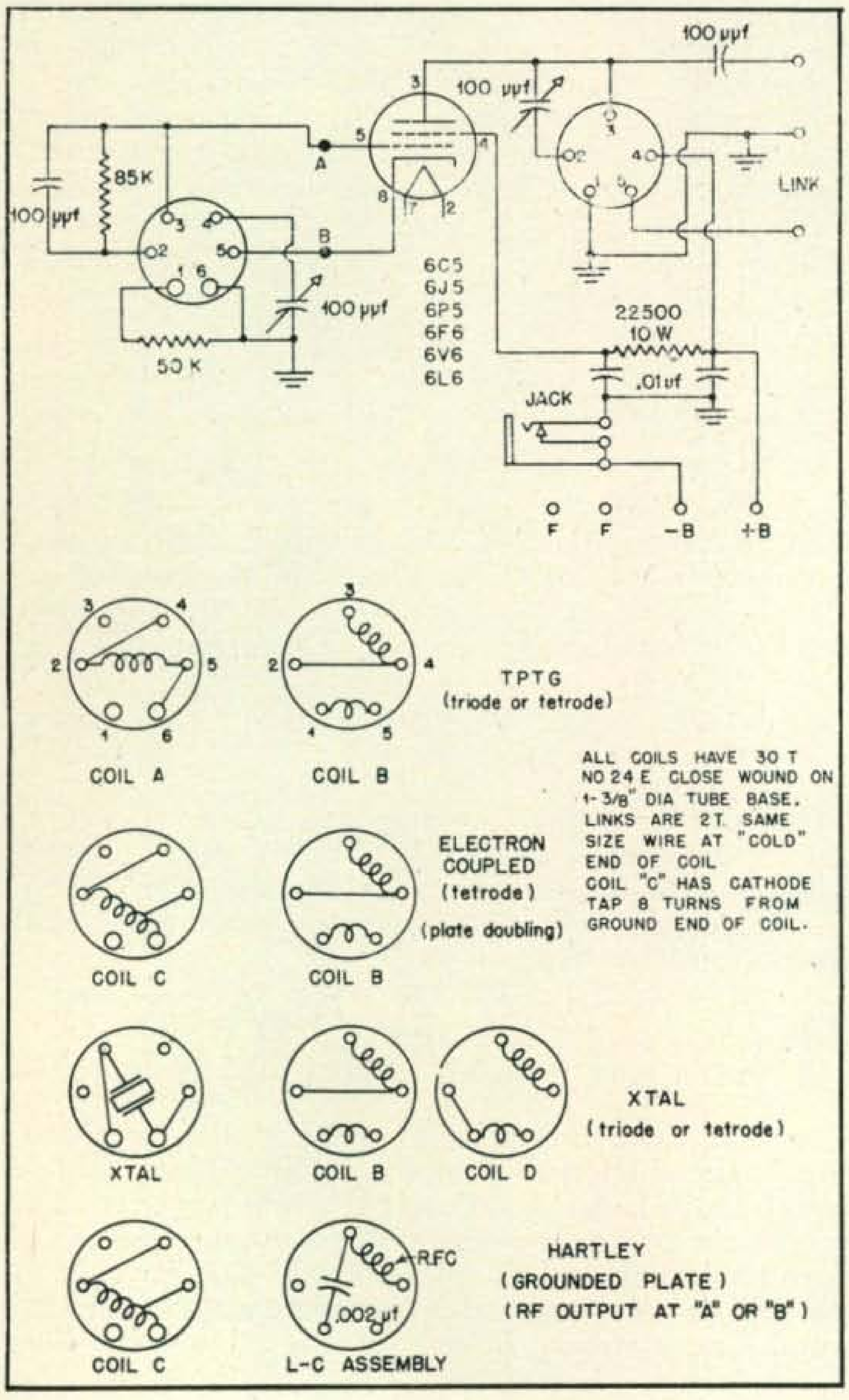


Fig. 1. Experimental oscillator circuit.

As for applications of more immediate interest, the usual home broadcast receiver and nearly every ham receiver is of the superheterodyne type. Such a receiver makes use of a small internal oscillator called the local oscillator. In communication superhets, to make code or "c-w" signals audible, a second small oscillator, known as the "beat-frequency oscillator," is employed. Radio-frequency oscillators, constructed so as to be extremely stable in operation, are also used in frequency meters, deviating from the calibration frequency by only a few cycles and thus making possible the accurate measurement of other signals.

These are but a few of the many uses which have been found for r-f oscillators. Primarily, the amateur is interested in the generation of r-f oscillations as a means of fixed or variable transmitter frequency control, and it was with this use in mind that the experimental designs to be described in this article were evolved.

Types of Oscillators

Historically, the first radio-frequency oscillators were self-excited. That is, the oscillations established by the vacuum tube and governed in frequency by the various constants employed in the circuit were maintained by virtue of the fact that a portion of the energy available at the output or plate side of the circuit was fed back by some means into the input or grid side of the circuit, thus overcoming the losses inherent in the circuit, and permitting sustained oscillations.

The problem is not so much one of starting the oscillations as it is of sustaining them. The instant that voltage is applied to a circuit, there is a surge of current through it, and the conditions necessary for starting oscillations are present. The problem is one of turning this surge on and off many thousands of times per second and of maintaining the conditions under which this may occur.

Because electronic circuits always contain some resistive component, there is inevitably some loss of energy through heat generated by the passage of current through such resistive elements. These losses must be supplied by means of an external power source. This external power source is usually connected to the output side of the circuit whereas many losses are sustained in the input side of the circuit. It is therefore necessary to feed a portion of the energy externally supplied back into the input side of the circuit, and this is generally done by either of two means

In reviewing receiver theory, we observed that the regenerative detector operated by virtue of the fact that a small portion of the plate-circuit energy was fed back into the grid circuit, thus greatly amplifying the weak signal received from the antenna. We also observed that if the amount of energy fed back were too great the circuit would break into oscillation, as evidenced by loud squeals. This detector employed inductive feedback. That is, we used an inductance common to both plate and grid circuits to return a portion of the plate-circuit energy to the grid circuit, thus helping to overcome losses and permitting a greater amount of efficiency in the circuit.

Another method of accomplishing the same purpose is by means of a capacitor which connects some part of the plate output circuit to some part of the grid circuit, thus transmitting a portion of the energy back to where it may be used to overcome input-circuit losses.

A considerably later development of the continuous-wave oscillator was that of the use of a slab of a piezoelectric crystalline substance as a means of controlling the frequency of the oscillations. In the self-excited oscillator, the frequency is controlled primarily by the particular values of inductance and capacity which may be present in the resonant circuit.

In the common type of crystal-controlled oscillator, a thin slab or disc of quartz, or, in some cases, tourmaline, is mounted in a holder so that it may be inserted into the grid circuit of the oscillator. Such a slab or disc is cut and ground to extremely close tolerances, since the frequency to be generated is dependent upon the dimensions of this crystal plate.

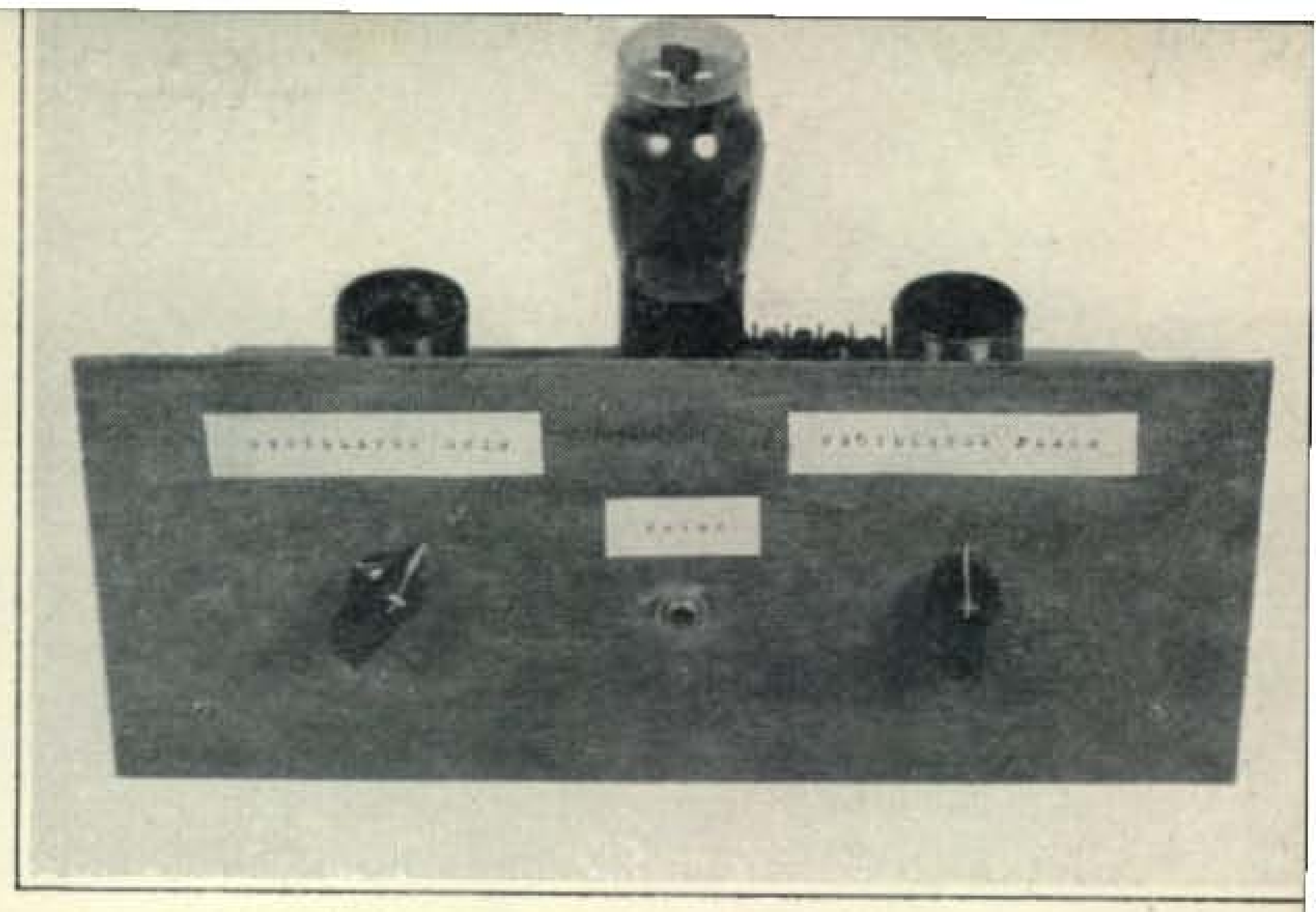
Crystal control was introduced because it permitted more precise control of the operating frequency than did the self-excited oscillator. Later developments have shown, however, that the self-excited oscillator, in certain of its modifications, may be employed to control frequency precisely enough for amateur operation, wherein a station need not remain upon a fixed frequency, but may vary its frequency at will so long as it does not transgress the limits of the frequency band in which it is operating.

For this reason, many amateur stations employ the "e.c.o." (electron-coupled oscillator) or the "v.f.o." (variable-frequency oscillator) in preference to the crystal, resorting to the latter when it is desired to operate on a spot frequency for a schedule or for network operation.

An Experimental Oscillator

The experimental oscillator shown in the accompanying photographs and diagrammed in *Fig. 1* was designed for flexible operation. It may be used as a tuned-plate tuned-grid oscillator; as a Hartley oscillator with its output frequency the same as the input frequency; as an "electron-coupled" oscillator with its output frequency twice the input frequency; or as a crystal oscillator with the output frequency the same as the input frequency. In the next article we shall describe an amplifier which may be used in conjunction with this oscillator, and the two together (or even the oscillator alone) may be used as a transmitter in the amateur c-w bands.

The oscillator was built on a 6″ x 8″ board, provided with cleats to hold it off the table, and



Panel view of the experimental oscillator.

bearing a 5″ x 8″ panel of 1/8″ thick tempered Masonite or Presdwood. The sole purpose of the panel is to provide a mounting place for the two tuning condensers and for the keying jack.

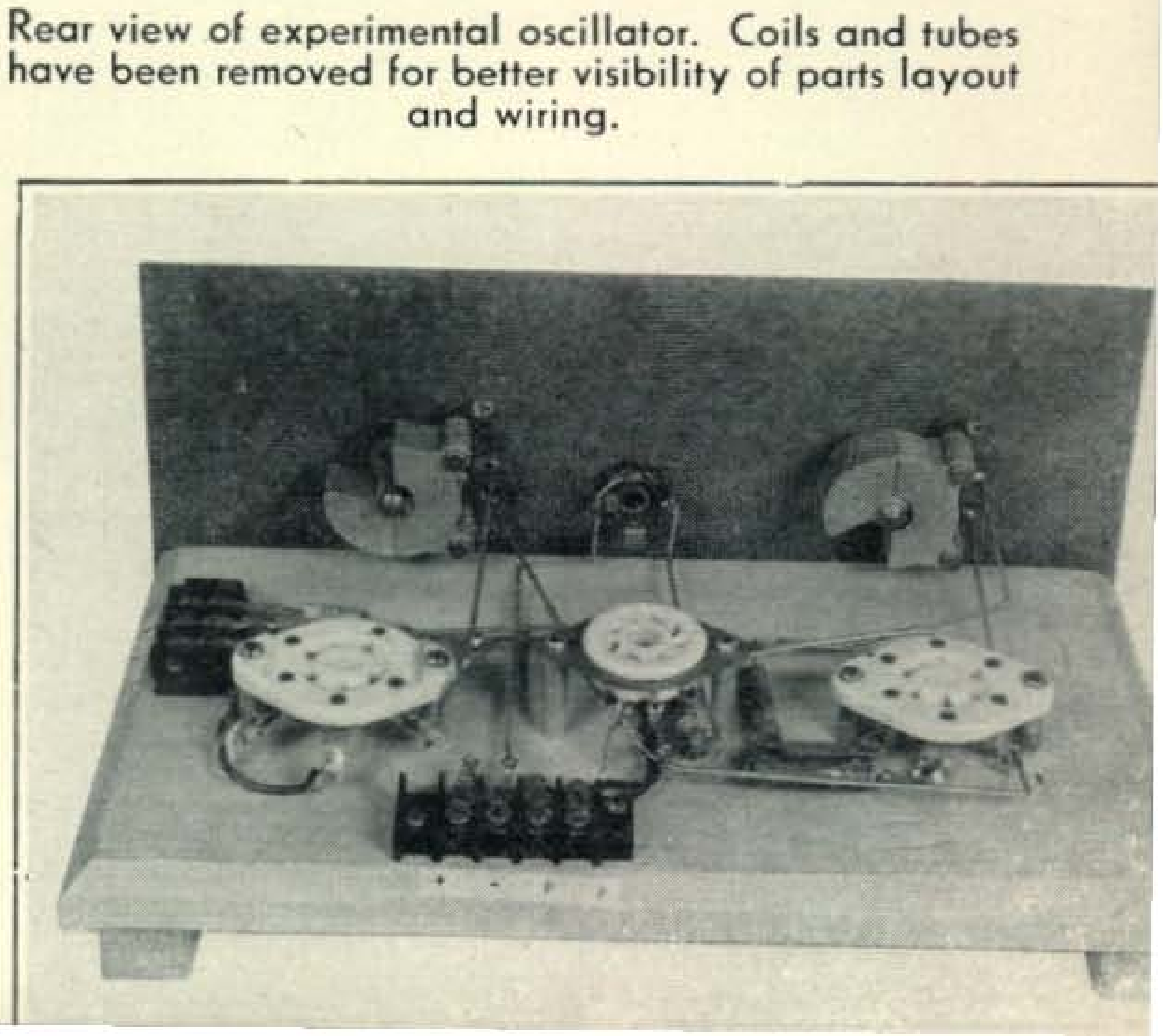
All of the wiring is above the wooden base except for one B+ lead and for the screen-voltage dropping resistor provided to feed the screen grid of a tetrode if one is used. The tube may be metal or glass. It may be a 6J5, 6C5, or 6P5 triode; or it may be a 6F6 pentode, or a 6V6 or 6L6 tetrode; and the center socket is provided to hold it, being so wired that any of the above tubes may be used without changes.

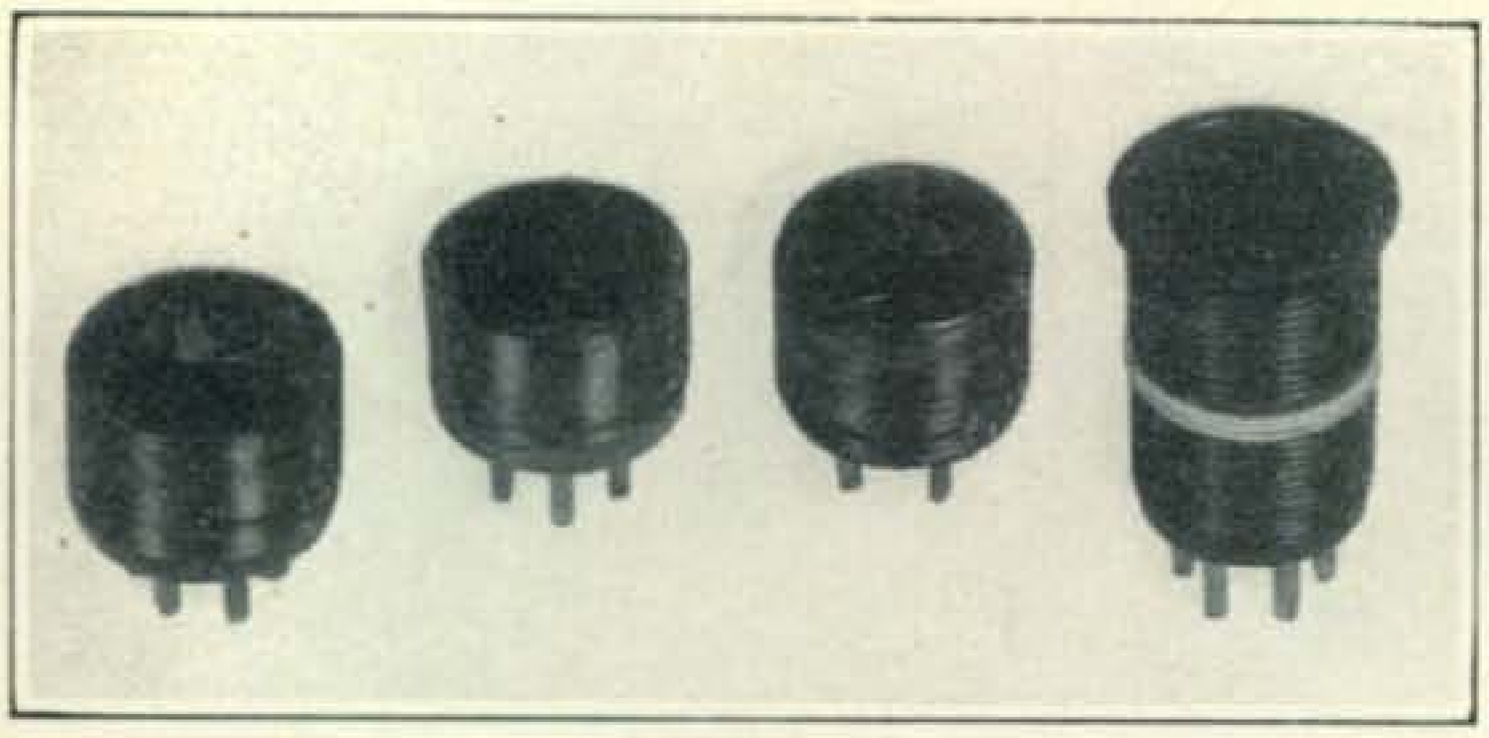
The grid tuning condenser is at the left side, with a socket for the grid coil or for the quartz crystal immediately behind it. The plate tuning condenser and its associated coil socket are to the right. At the rear of the board is a terminal strip to admit filament and plate voltages, and to the right of the board, near the plate coil socket, is a three-terminal strip to provide either capacitive or link-coupled output from the oscillator.

Most wiring was purposely done above the base board with large (No. 14) tinned copper wire, called "bus-bar," so that circuit details would be more evident in the photographs. The wire which runs the length of the base, down the center, is the common ground lead, and all connections returning to ground or to "B" minus are made to this lead.

It should be pointed out that this type of construction, called "bread-board" is not the usual thing for present-day amateur apparatus. It is rather wasteful of vertical space, and does not provide the shielding which is inherent in a metal chassis. It is convenient in experimental or demon-

Rear view of experimental oscillator. Coils and tubes have been removed for better visibility of parts layout and wiring.





Coils for the experimental oscillator and amplifier. The two on the left are oscillator coils, while the two on the right are for the amplifier.

stration apparatus, however, and for that reason is used here. In actual construction, every effort should be made to obtain connecting leads which are as short as possible, consistent with mechanical rigidity and a desirable physical layout.

The coils may be wound upon manufactured forms, and these are the most convenient to use. For experimental purposes, however, bases from old-style vacuum tubes are entirely suitable. Tube bases were used in winding the coils for the experimental oscillator pictured. Their chief drawback lies in the fact that they are sometimes not quite long enough to take the desired winding. It is often possible, however, to remedy this difficulty by cementing to a tube base a length of tubing of some insulating material. The local radio service man probably will have a junk box containing a number of defunct tubes.

All coils are wound with No. 20 enameled wire. The various circuits which may be employed are obtained by virtue of "jumper" connections within the coil forms, as shown on the coil diagram.

The coil sockets and the tube socket are spaced above the chassis by means of metal bushings, but wooden doweling might equally well be employed. Wood screws fasten the sockets to the wooden base. There are two exceptions to the use of bus-bar in wiring, and these are the filament leads, which are No. 20 push-back wire, and the twisted pair of wires coming from the link on the plate coil to the terminal strip to the right. All connections are, of course, well soldered at their respective terminals.

The power supply may well be that shown in an earlier article in this series. It will supply adequate current at a voltage well within the scope of the tubes suggested. It should be connected to the oscillator by means of well-insulated leads of fairly heavy wire. No. 16 stranded insulated push-back wire will do nicely.

Self-Excited Oscillators

The method of operation of a self-excited oscillator was mentioned briefly a few paragraphs back, but a more detailed description of the processes involved is in order. Fundamentally, all oscillators depend upon the ability of a vacuum tube to amplify a signal. We stated that, when voltage is applied to a circuit, there is an infinitesimal portion of a second during which all the conditions for oscillation are present.

When power is applied to a correctly designed vacuum-tube circuit, the extremely small signal generated during the short period of current build-up is immediately amplified by the tube. Since the tube has some capacitance between its input and output sections, a portion of this amplified signal is returned to the grid or input section, where it reinforces the extremely small signal. If the signal were not reinforced in this manner it would die because it is not strong enough of itself to overcome the natural losses of the circuit.

It is necessary to feed back to the input only a very small portion of the amplified signal and only enough to supply the natural losses in the grid circuit. It may be fed back in any convenient manner, but in practice the two methods most often employed are capacitive feedback or inductive feedback.

In some circuits the inductance employed to feed back the plate voltage may be a separate winding on a form common with the grid-tuned circuit coil (*Fig. 2A*). Conversely, it may also be a separate grid winding on a form common with the plate tuned-circuit coil (*Fig. 2B*). Such a feedback coil is often called a "tickler," and we thus may have a grid-tuned plate tickler circuit, or a plate-tuned grid tickler circuit.

A variation of this general type of oscillator makes use of a single coil, a portion of which is common to both plate and grid circuits by virtue of being connected to the tube cathode. Since the cathode is the element through which both grid and plate current flows, it follows that both circuits are represented when some connection is made to the cathode.

In each of the above cases, the amount of *excitation* or drive to the oscillator tube is controlled by the number of turns on the feedback winding, or its proximity to the tuning winding, or both. In the case of the tickler type circuit, the number of turns on the tickler coil is generally the most convenient method of controlling excitation. In the case of the common-cathode circuit it will be observed that the tube cathode is connected to a tap on the coil. The excitation is determined by the position of this tap, the number of turns common to both circuits in proportion to the total number of turns on the coil being the determining factor.

A second method of controlling excitation and sustaining oscillation is by means of capacitive feedback of some nature. The tuned-grid tuned-plate circuit shown in *Fig. 3* is an example of this, and may be demonstrated on the experimental apparatus described.

The two coils have an amount of magnetic (inductive) coupling insufficient to sustain oscillation; hence the only feedback present is that supplied by means of the grid-plate capacitance of the tube. If the tube had a grid-plate capacitance insufficient to sustain oscillation, as might be the case with some well-designed screen-grid tubes, it would become necessary to connect a small capacitance externally from grid to plate to perform this function.

In the case of the tuned-grid tuned-plate circuit, the two circuits must be adjusted to resonate on approximately the same frequency in order to bring the amount of feedback to a point which will sustain oscillation. One of the two circuits will be found to have a greater control over frequency, and the other a greater control over the excitation (hence, the output) of the oscillator.

Fig. 4 shows two forms of a circuit well known as the electron-coupled oscillator. This circuit derives its name from the fact that it employs a screen-grid tube, and the screen grid actually becomes the anode or plate of the oscillator circuit. The actual tube plate is connected with the oscillating circuit only by virtue of the electron stream within the tube. Since the plate has no real connection with the oscillating circuit, changes in plate loading and plate voltage show less effect upon the frequency of oscillation, and such circuits are often used in cases which demand unusual frequency stability. The frequency is determined by the grid tuning, and feedback is derived from the common cathode coupling.

The plate circuit may be fed by means of a radio-frequency choke, as shown in *Fig. 4*, in which case the output frequency is identical with the generated frequency. Alternatively, as in *Fig. 4b*, the plate circuit may be tuned so as to resonate at a harmonic of the generated frequency, and in this case output may be obtained at the second or third or even higher harmonic of the fundamental frequency.

Although one obstacle to stability has been overcome in this circuit, there are still others which, taken singly or in combination, may reduce the effectiveness of the circuit in this respect.

One of these is tube heating. As a tube heats up its interelectrode capacitances change. Since some of these are in shunt with the tuning capacitor, such a minute change in capacitance within the tube may cause a change in frequency if this tiny capacitance forms any appreciable portion of the total capacitance across the coil. Obviously, if the coil were large and the tuning capacitor small, such would be the case. The remedy is therefore to make the coil relatively small and the tuning capacitance large. The small interelectrode capacitance change thus will have relatively little effect upon the total capacitance in use, and will not greatly change the frequency.

Plate and screen voltage also have considerable effect upon the frequency stability of a vacuum-tube oscillator. Anode (plate) voltage is a prominent factor in determining the frequency of oscillation, and hence should remain as constant as possible. Ordinarily an oscillator is tuned by varying a capacitor, not by varying the plate voltage. Plate voltage is relatively more difficult to control with any degree of accuracy; hence, the solution is to make the anode voltages stable, and for this reason oscillator plate and screen voltages are often supplied from a voltage regulator of some description.

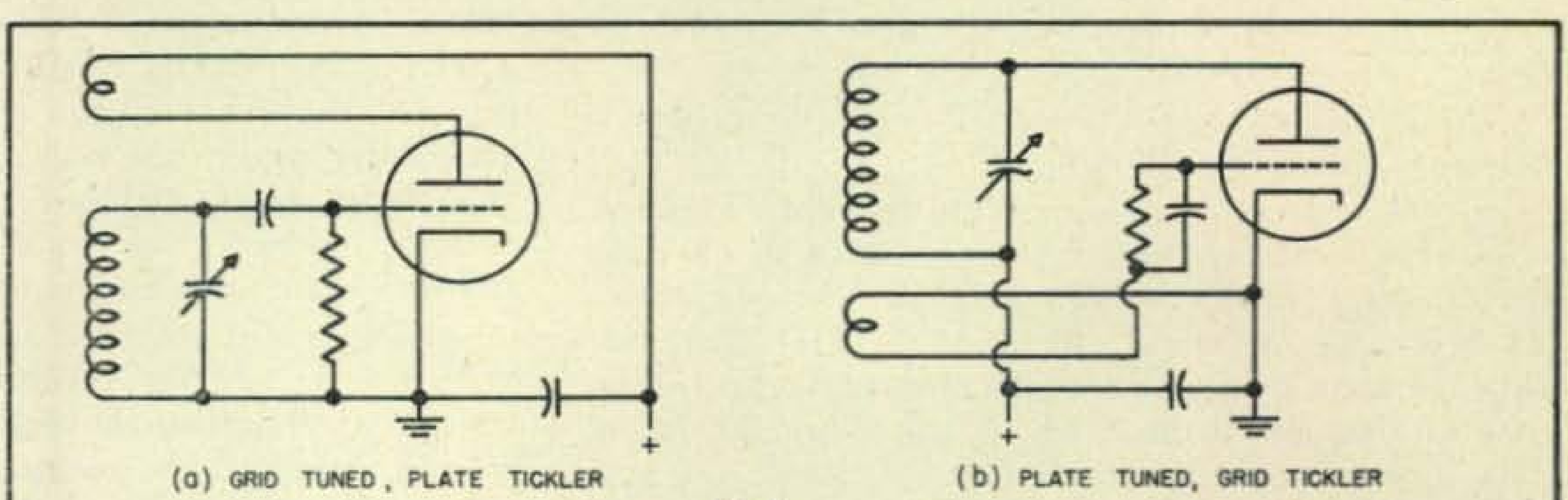
With proper choice of components and due attention to mechanical stability of the circuit, the self-excited oscillator may be made to approach the stability of the crystal oscillator.

Crystal Oscillators

Earlier we pointed out that crystalline slabs might be employed in an oscillator circuit to achieve a high degree of frequency stability. Ordinarily slices of quartz crystal are used for this purpose, mounted in some sort of a holder provided with accurately ground and polished metal plates which are held in contact with the faces of the crystal, usually be means of some sort of spring tension device. These plates provide the necessary electrical contacts.

There are a number of different crystal "cuts." That is, the mother crystal itself may be cut along any one of several planes (relative to the axes of the crystal), each of these cuts producing a crystal blank which may be finished into a usable slab of

(*Continued on page 95*)



(a) GRID TUNED, PLATE TICKLER (b) PLATE TUNED, GRID TICKLER

FIG. 2

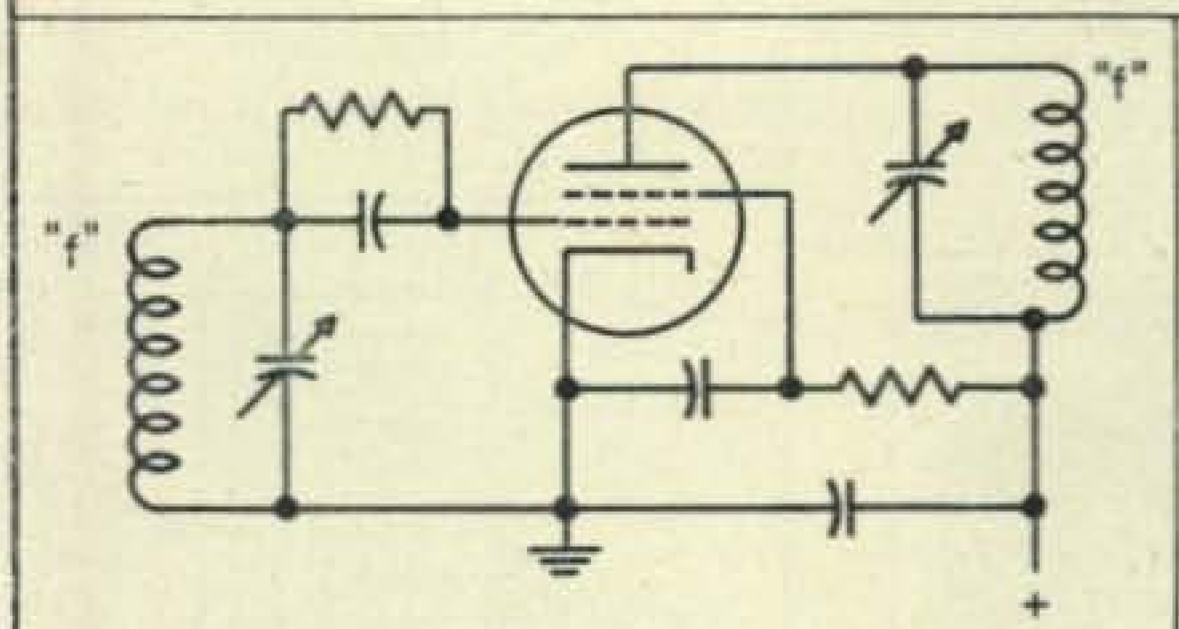


FIG. 3 TUNED-PLATE TUNED-GRID

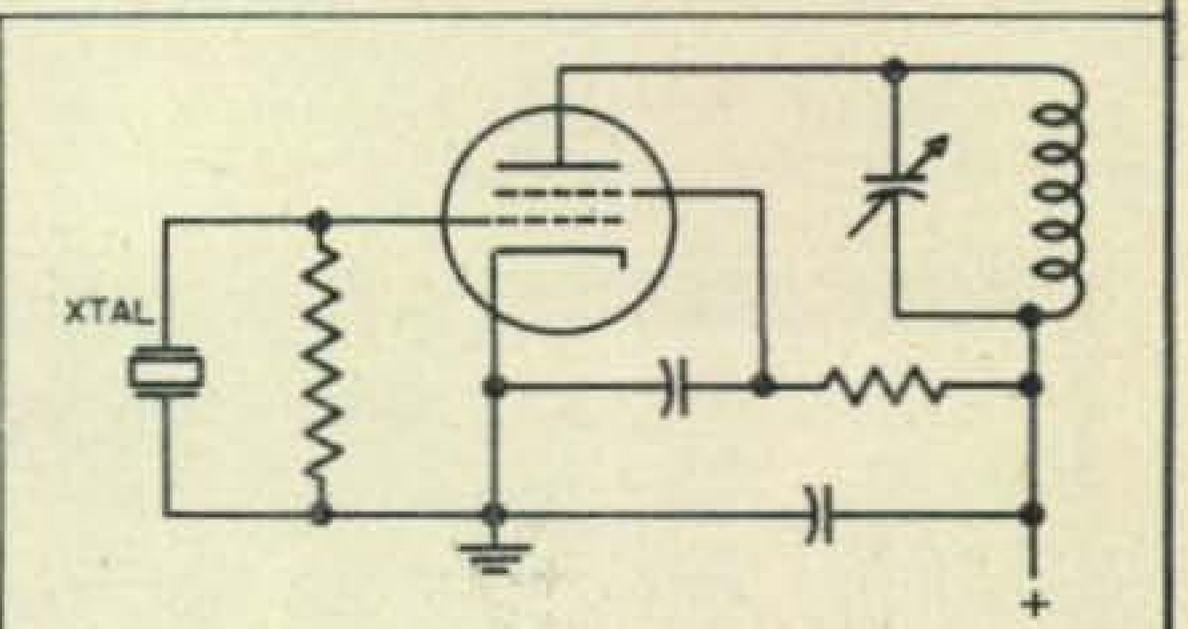


FIG. 5 CRYSTAL OSCILLATOR

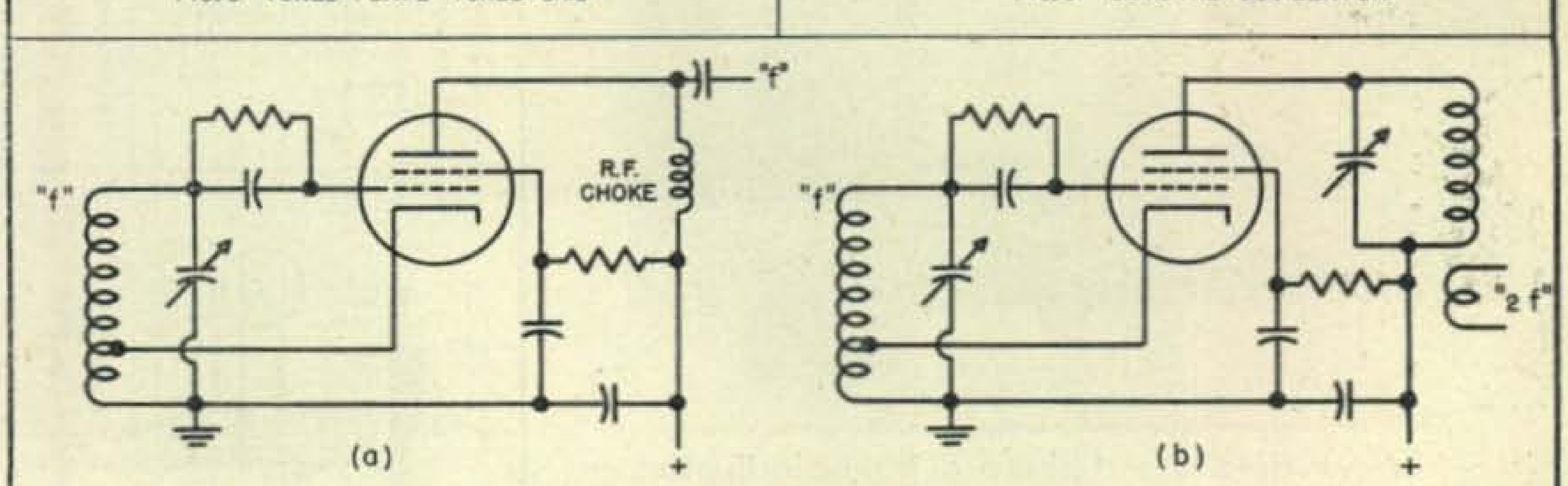


FIG. 4 ELECTRON-COUPLED OSCILLATOR

Automatically Tuned
All-Band Kilowatt

VERNON VOGEL, WØHMS*

Part 2, covering the constructional details of this unusual all-band kilowatt.

IN PART I OF THE ARTICLE appearing last month the basic theory of the phase detector circuits for automatic tuning was discussed fully. Part 2 deals with the practical application of this theory in a 1-kw c.w. and 600-watt phone transmitter that is, within very minor limitations, *single dial control.*

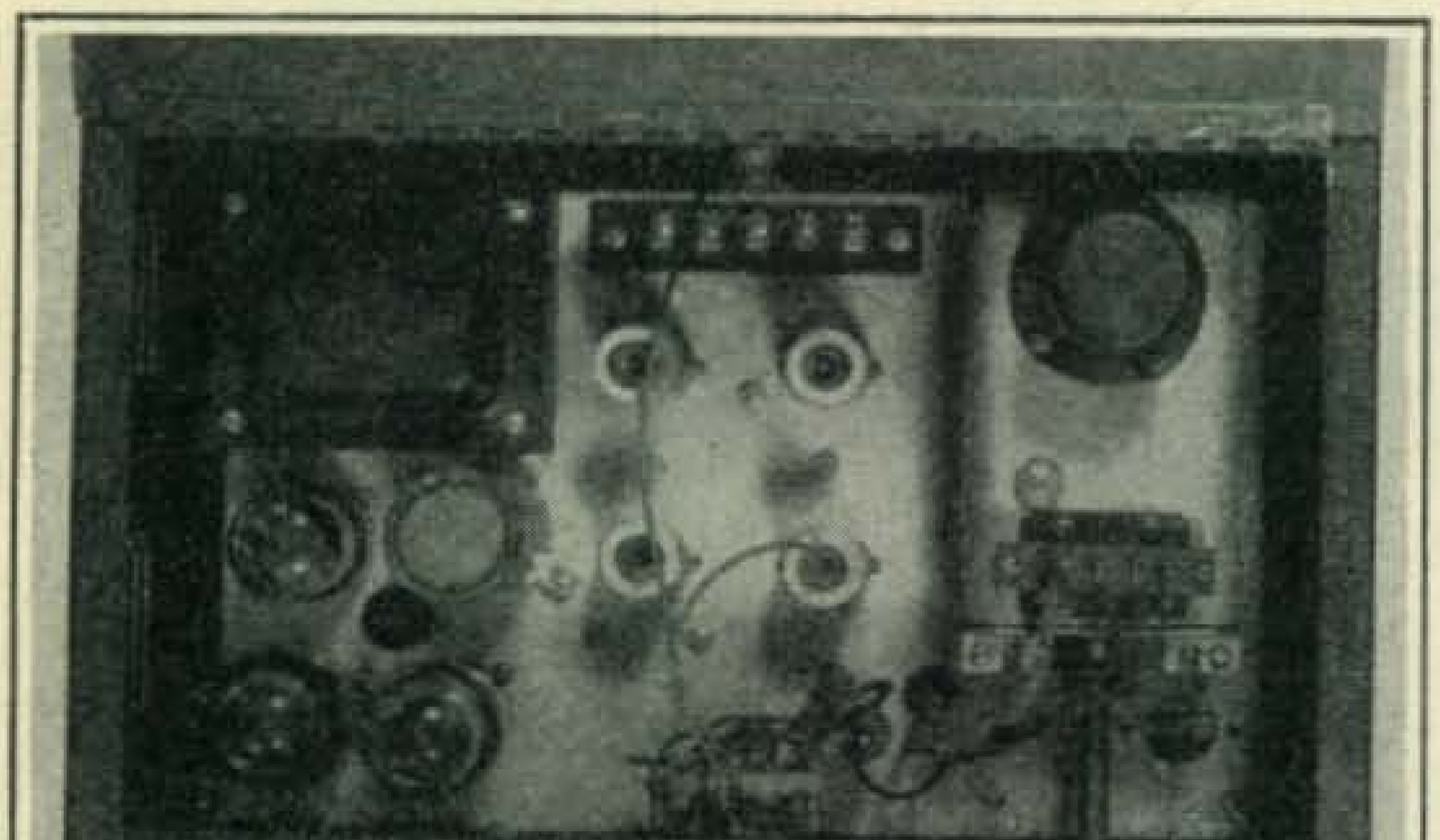
The v-f-o unit consists of a Collins 70E-8 permeability tuned oscillator with a frequency range of 1600 to 2000 kc which multiplies into all amateur bands. The HRO dial was adjusted for zero at the low-frequency end of the bands so that kc in the band can be read accurately by means of multipliers for the various bands. The present amateur version of the 70E-8 oscillator is furnished with a dial which reads directly in kilocycle steps to an accuracy of 0.015%, so that accurate frequency control is maintained at all times. The v-f-o, including power supply and buffer tubes, is built in a 7″ x 12″x 8″ hinged cabinet.

The 70E-8 as shown in *Fig. 7* is fed directly to a 6AK5 isolating buffer which in turn couples to a 6C4 tube with a 3500-ohm plate resistor. This low resistance load provides sufficient drive to the first buffer stage in the transmitter at the end of an RG8U cable 50′ long. A 6BA6 crystal oscillator tube permits optional use of crystals whose fundamental frequency must be in the 80-meter band. The key plugs into the v-f-o unit and a toggle switch controls carrier on-off for phone operation.

**Engineering Research Associates, Inc., 1902 W. Minnehaha Ave., St. Paul 4, Minn.*

Relay *K1* is a 300-ohm midget telephone type which removes voltage from some of the tubes in a Collins 75A receiver, and transfers this voltage to a built-in audio oscillator for c-w tone monitoring. When phone is used, the phone switch opens the monitor lead to prevent audio tone on phone. The relay *K1* although not a good keying relay, is sufficiently fast for monitor purposes; and, of course, does not affect the transmitter keying. Relay *K2* is a sensitive 8000-ohm Sigma type 41 relay operated by *K1*. The coil of *K2* is shunted by *C1*, a 20-μf 50-volt electrolytic paper condenser. This condenser provides sufficient time lag on *K2* so that the crystal oscillator and buffer tubes have their cathodes grounded during normal transmission. If the key is released for a short time, the relay releases, thus removing excitation, and the operator can receive on any frequency, including his own v-f-o frequency. This results in semi-break-in operation. This compromise in break-in was required since keying in the buffer stage, as first tried, resulted in severe key clicks which did not yield to the usual RLC contact filtering. Since wave shaping of the keyed characters in the early stages is extremely difficult in any event, it was decided to key the 807 buffer and screens of the 4-125A final amplifier tubes, which is done by keying the negative 550-volt ground lead. This resulted in satisfactory keying without excessive clicks.

A short piece of wire around the 6AK5 tube comprises *C2* which is connected to a toggle switch,



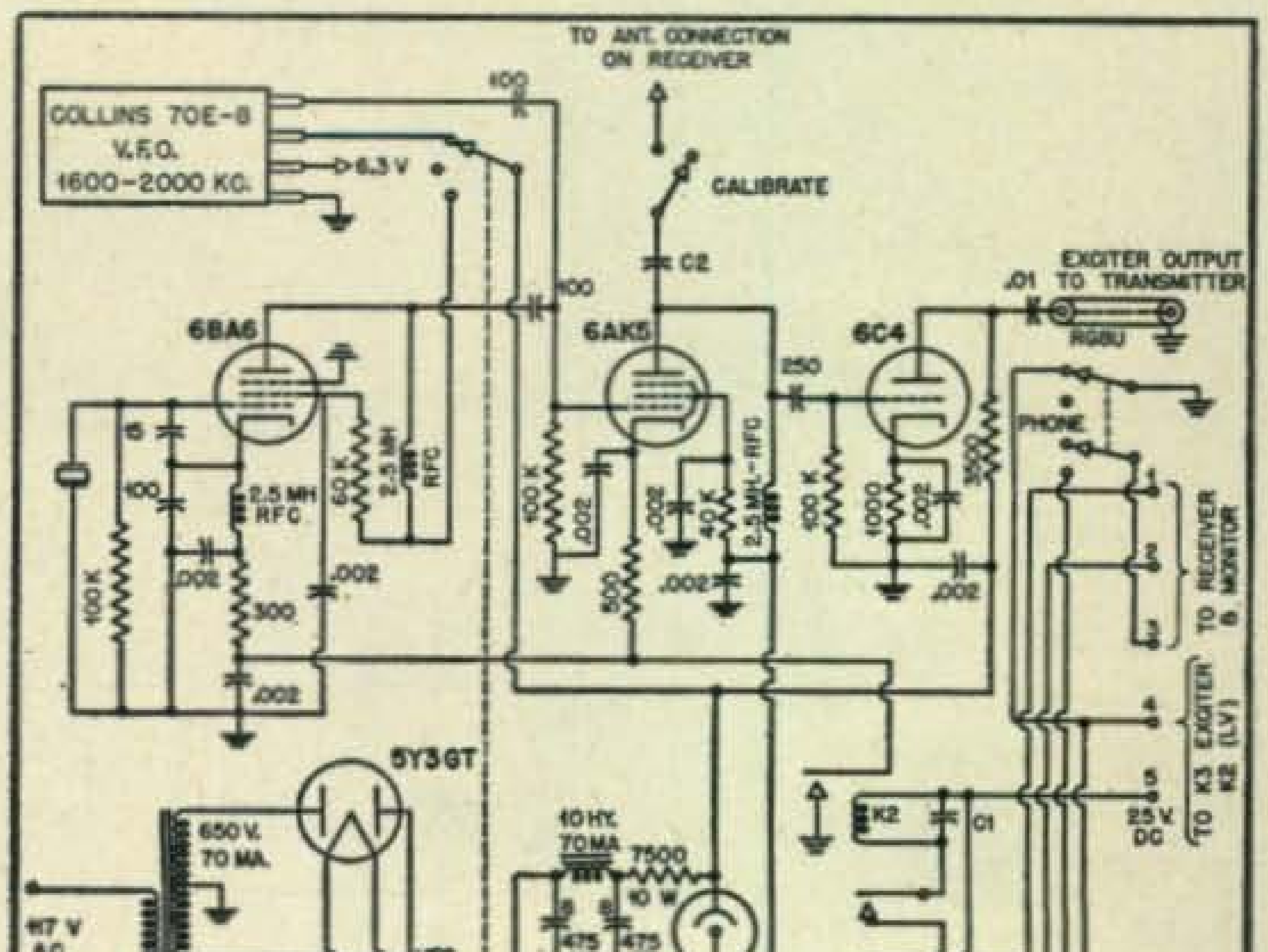
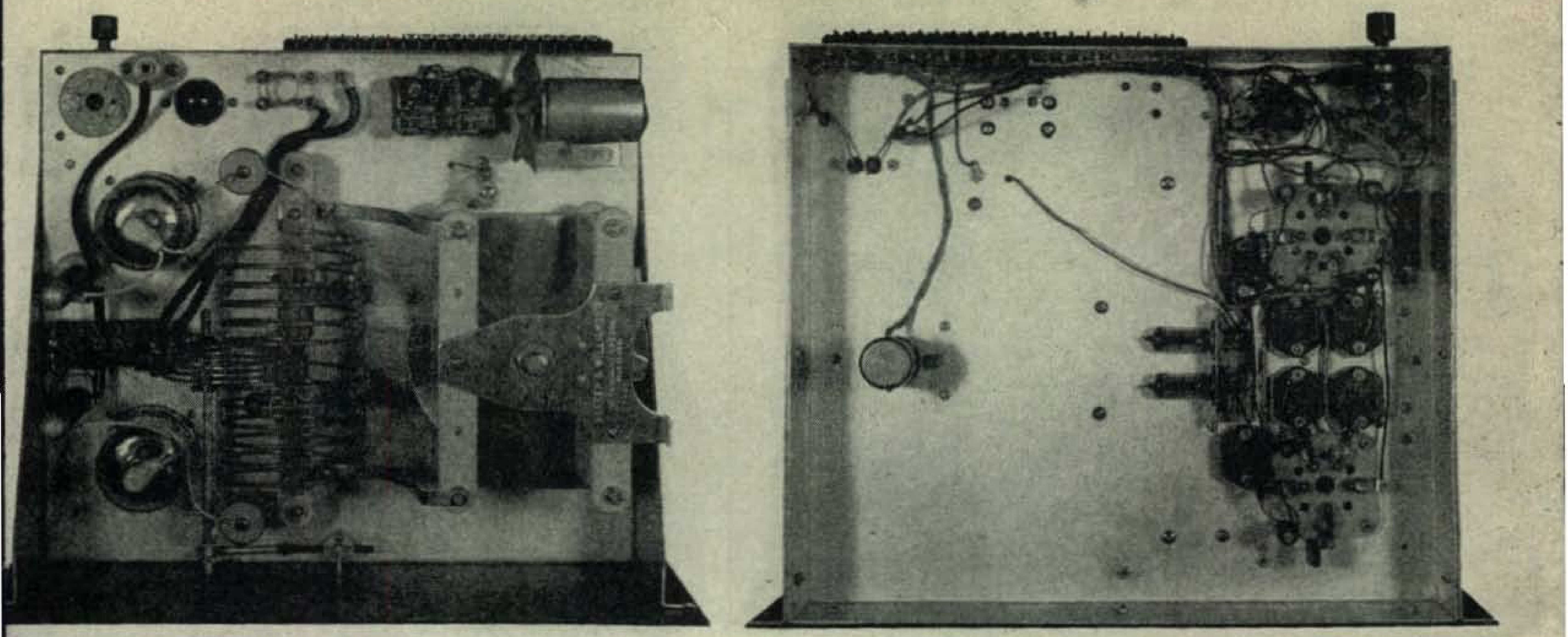


Fig. 7. Circuit details and photo of the isolating buffer incorporated in the table-top control unit. Components C1, C2, K1 and K2 are explained in the text.



Top and bottom view of the final amplifier employing Eimac 4-125As.

and then to the receiver antenna terminal. This permits switching in and out v-f-o pickup in the standby position which is useful for frequency spotting. It is essential that the v.f.o. be well shielded, and it may be necessary to bypass the a-c line and other leads coming from the v-f-o unit to keep the feed through to the receiver down below normal signal levels.

The transmitter is built in a 42″ Parmetal cabinet, and consists of four units. The top unit (*Fig. 8*) is the 4-125A power amplifier, and has a single control knob for varying link coupling.

The second unit down (*Fig. 9*) contains the r-f exciter and speech amplifier. This unit contains all meters, the band switch, a meter switch, clipper level control and a jack for microphone input.

The third unit (*Fig. 10*) contains the low voltage power supplies, relay supply voltage, bias supply voltage, and the modulator. It has main POWER ON-OFF switches, TUNE-OPERATE switch, HIGH VOLTAGE ON-OFF switch, and the PHONE-C.W. switch.

The fourth unit (*Fig. 11*) contains the high-voltage power supply and its associated relay system. It is mounted directly on the bottom of the cabinet, and has the overload reset button on the panel.

The upper three units are mounted on 17″ x 13″ aluminum chassis 3″ deep. These units are front panel supporting by means of two 1/8″ aluminum brackets with the lips bent out. These lips extend out to the panel edges, and thus support the entire chassis weight against the edges of the cabinet. This permits the use of 1/8″ aluminum panels without warp or deformation. The panels are painted black wrinkle finish and controls marked with Millen decals to provide a finished appearance. Casters on each of the four corners of the cabinet permit it to be rolled about.

Exciter-Speech Amplifier Unit

The exciter-speech amplifier unit (*Fig. 9*) is laid out with both low-level stages going from the front to rear. The layout of these units is close and compact, but no difficulty was experienced with r.f. from the exciter getting into the speech amplifier. However, r-f difficulties were experienced with the final amplifier on, and this was remedied by putting an r-f filter in the microphone lead and small shunt capacitors from plate to ground in the first two audio stages. Additionally, electrolytic cathode bypass condensers are shunted by r-f bypasses.

The speech clipper circuit choke *CH1* is 3.75 henries and should be a high quality audio reactor. The MODULATION adjust control is located on the chassis and is a slotted control with a lock. Modulation should be adjusted for approximately 90% and this control locked. This adjustment must be made using a scope or modulation meter since serious splatter will result if clipping is used with overmodulation. The degree of clipping is controlled by the CLIPPER front panel adjust control.

The exciter is fed from the coax to a 6AK5 buffer into a 6AK5 doubler. The 6AK5 doubler operates into a 6AK6 buffer, and automatic tuning is then applied between input and output of the buffer.

A 6AG7 is used as doubler, tripler, and quadrupler on 20, 15, and 10-meter operation, respectively. On 80 and 40 meters, the 807 is driven directly from the 6AK6 operating as buffer and doubler

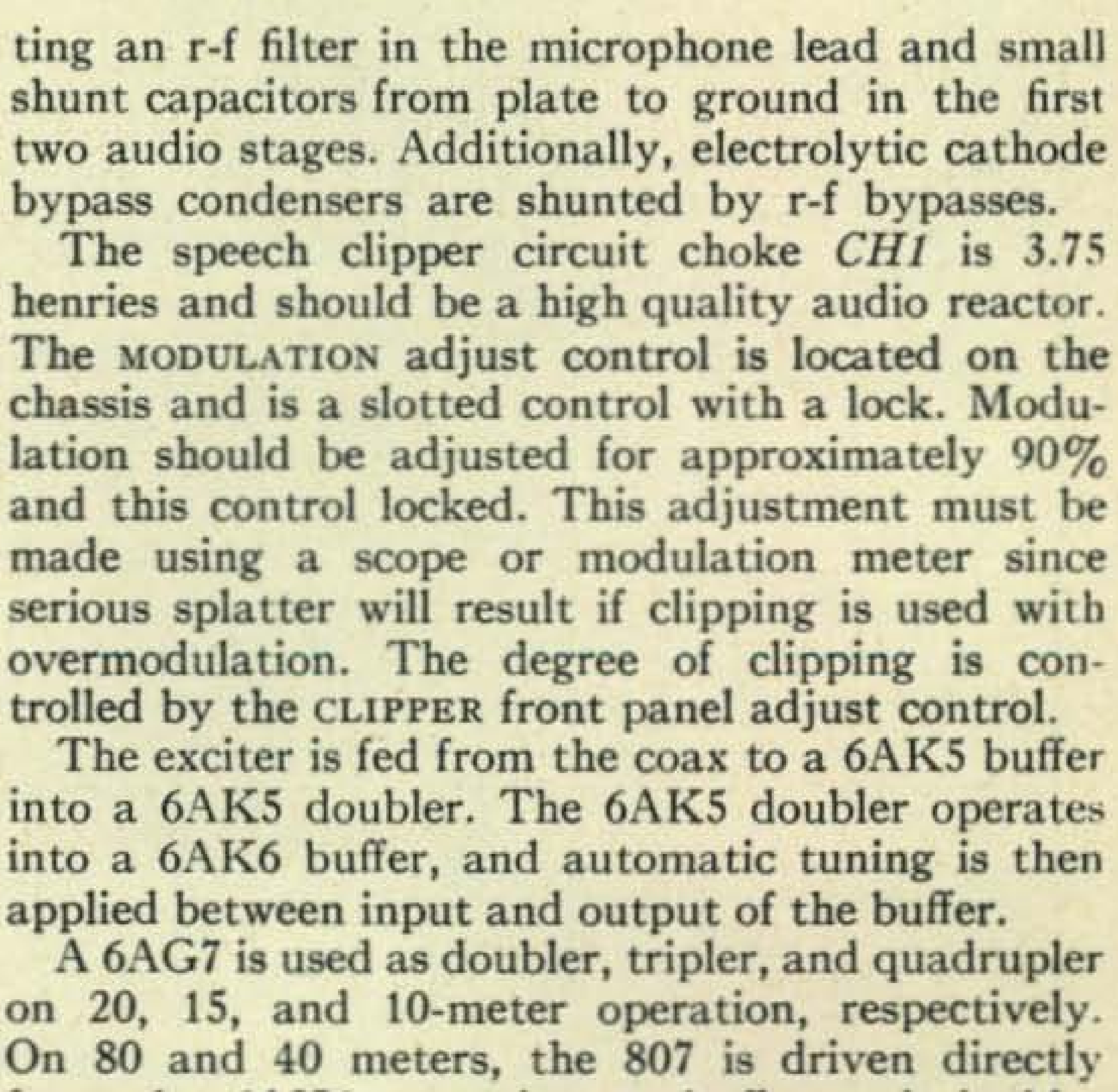


Fig. 8. Final Amplifier Circuit.

C1—26-82 μμf per section, B & W Type CX45C
C2—25-μμf 7500-volt vacuum condenser, G.E. Type GL1L36.
C3—See text.
RFC1, RFC2—180 turns at 40 turns per inch, No. 30 wire on ¾″ diameter form. NOTE: Spacing of turns is important.

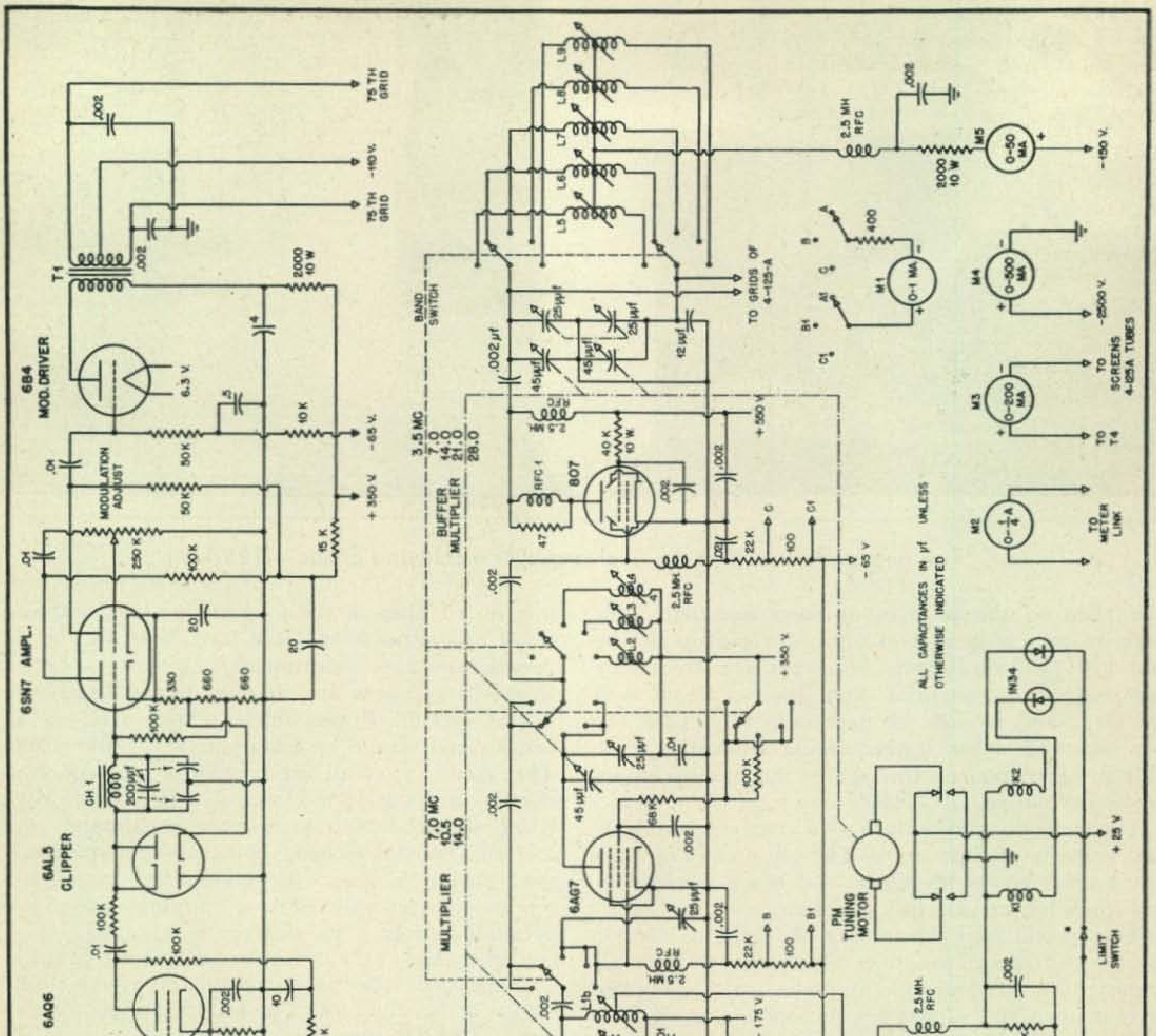
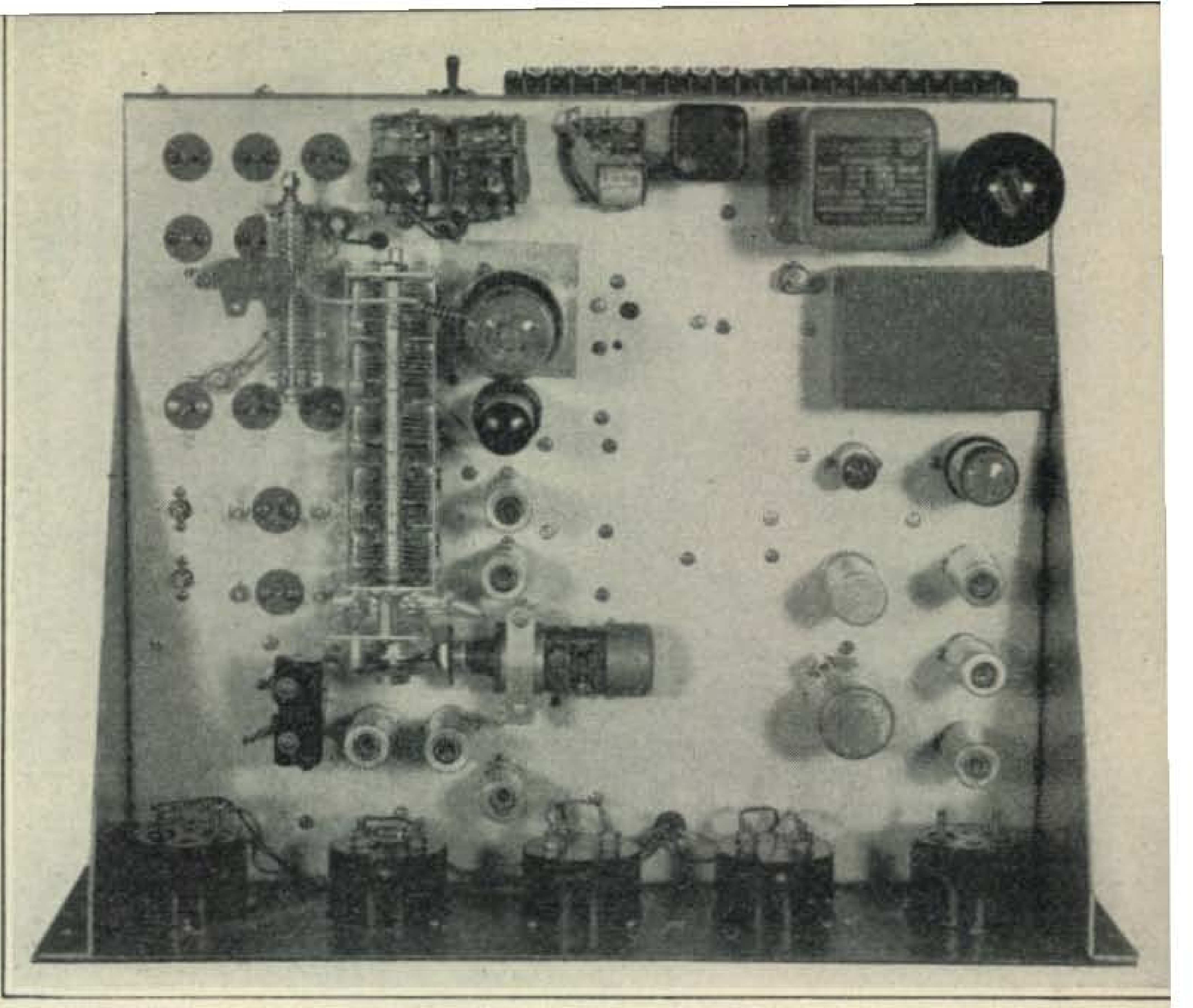


Fig. 9. Exciter and Speech Amplifier Circuit.
K1, K2—see text.
K3—1000-ohm Sigma type-keying relay.
CH1—See text.
CH2—0.15-h 200-ma choke.
T1—2500 ohm primary to 15,000 ohm total secondary.

Looking down on the ganged automatically tuned exciter and the modulator speech amplifier on the right hand side of the chassis.



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respectively. On 20, 15, and 10 meters the 807 always operates as a doubler driven by the 6AG7. *RFC1* is a parasitic choke which consists of six turns No. 18 wire wound about the 47-ohm 1-watt parasitic resistor.

A five-gang variable with a capacity range of 10 to 45 μμf is used to tune the exciter stages. This condenser has a 3/32 plate spacing and is a surplus market item. The exciter coils *L1* to *L9* inclusive are wound on 1″ x 1¾″ ceramic forms. Powdered iron slugs 5/16″ wide by 3/8″ long are used for trimming, except the 807 10 and 15-meter coils which are tuned by similar sized brass slugs. This trimming can, of course, be accomplished by moving turns on the coils. If slug tuning is used, it should be remembered that iron will increase inductance whereas brass will decrease it. Because of variations in available tuning capacitors, switching systems and other variables, no coil winding data is given. Incidentally, a grid dip meter[1] is invaluable for the exciter tracking and tuning work as well as coil winding.

Exciter Automatic Tuning

The adjustment of the exciter automatic tuning is straightforward. The circuits are lined up in the usual manner of ganged circuits with the 5-gang tuning condenser rotated manually. The v.f.o. is then set up for the center of the 80-meter band, and the tap on *L1* adjusted until best automatic tuning action results when the condenser is rotated either side of resonance. Improper adjustment will result in the motor tuning the condenser through resonance until the limit switch stops the motor.

1N34 rectifiers in series with *K1* and *K2* provide polarized relay action. These relays are 18,000-ohm Sigma type 4F relays and should be adjusted for maximum usable sensitivity.

The permanent magnet tuning motor is a geared down 250 r.p.m. motor used in gun computers and available on the surplus market.

The low voltage, bias supply, and modulator unit (*Fig. 9*) is built largely of surplus items, and this accounts for the unorthodox circuits. Standard transformers *T1* and *T2* with 5-volt filament windings will permit the use of 5Y3 or similar rectifiers in place of 6X5s. Because 28-volt d-c relays are plentiful and inexpensive on the present surplus market, it is worthwhile to obtain a copper oxide or selenium rectifier of 25-volt, 2 to 3-amp. rating for relays and d-c motor supply. Transformers with output of 20 to 30 volts a-c are occasionally available; if not, an open frame 866 rectifier transformer can easily be rewound with No. 16 or No. 18 wire to obtain this voltage.

Regardless of what transformer-rectifier system is used for bias, the bleeder system shown is workable. The series 500-ohm resistor should be replaced by some value which does not permit the VR150 tube to glow with key up, but permits it to glow with key down. *K1* is a 500-ohm midget telephone type relay and provides tube protection in case of bias failure.

The PHONE-C.W. switch is a large telephone type switch performing a number of functions. It opens the modulator filaments on c.w., shorts out the screen winding on *T4*, removes the speech amplifier filament voltage, and additionally operates

[1] "About Grid-Dip Oscillators," Bane, *CQ*, Mar., 1947 "The Dipper," Scherer, *CQ*, May, 1947.

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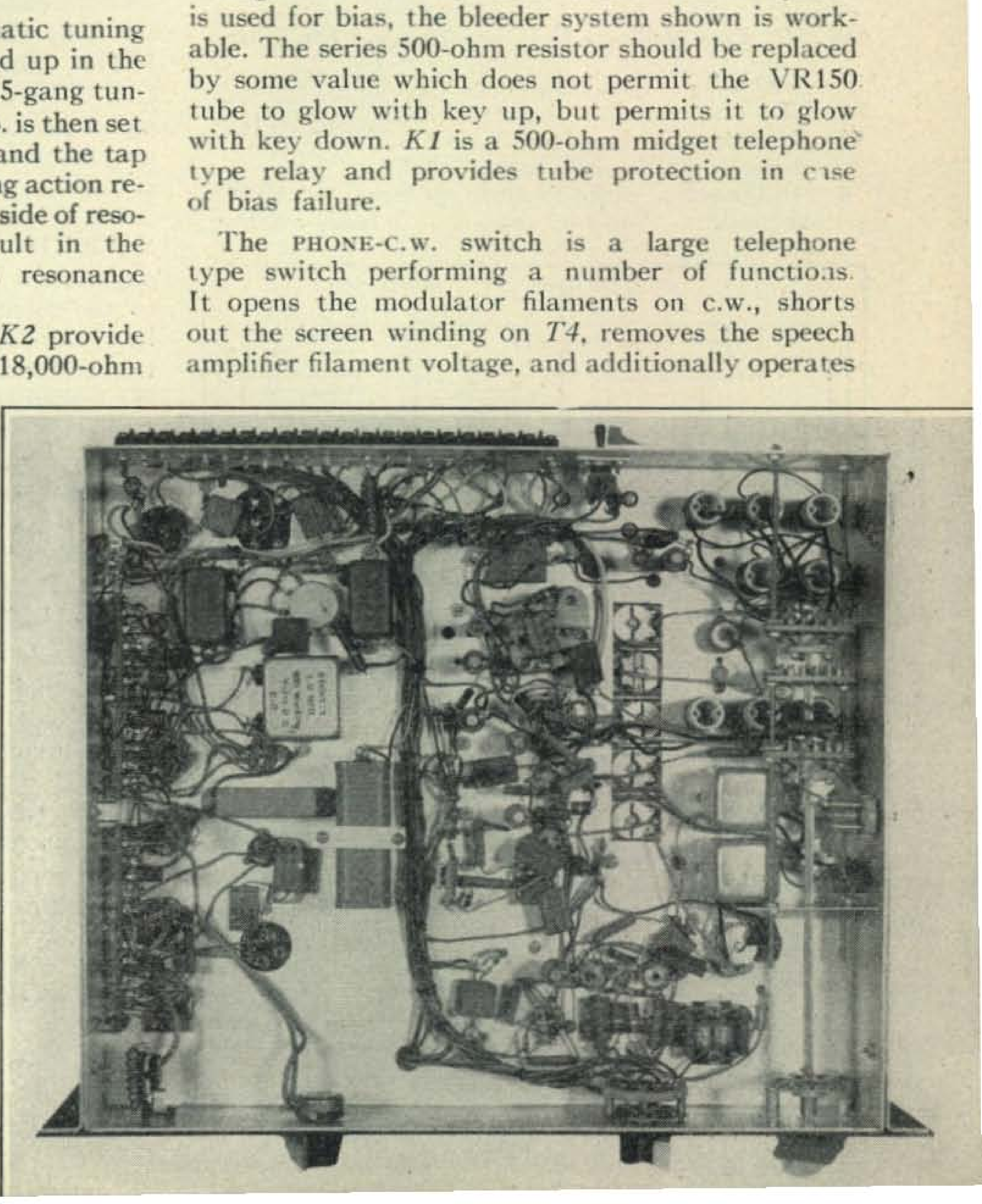
Under chassis view of the exciter and modulator. Crowding is avoided by the use of large size chassis.



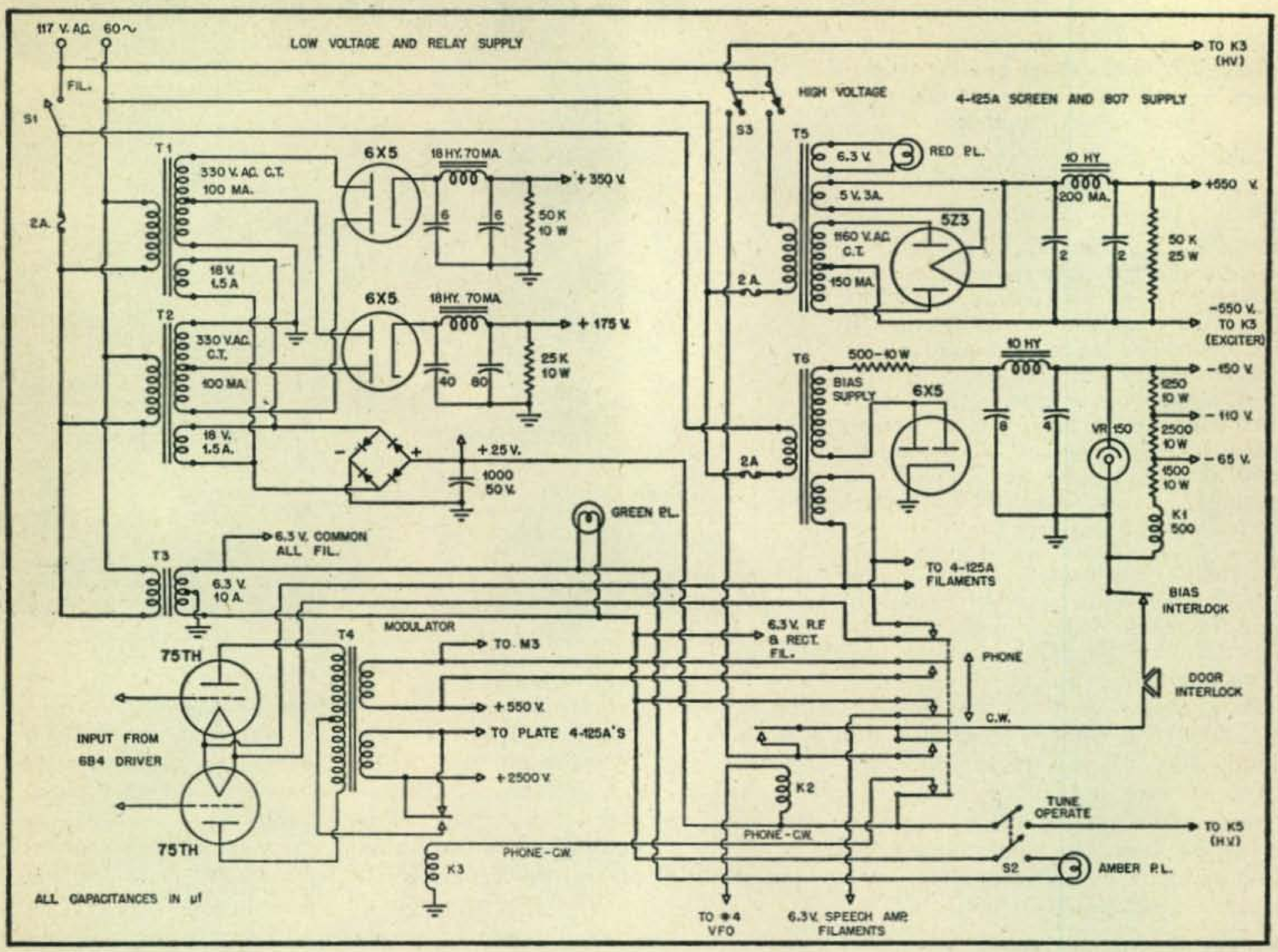


Fig. 10. Low Voltage D-C Supplies and Modulator.

K1—500-ohm midget telephone type.
K2—500-ohm midget telephone type.
K3—28-volt coil h-v relay. Insulation 2500 volts to ground; 2500 volts across contacts.
T4—18,000-ohm plate-to-plate primary to 10,000 secondary. See text regarding screen winding.

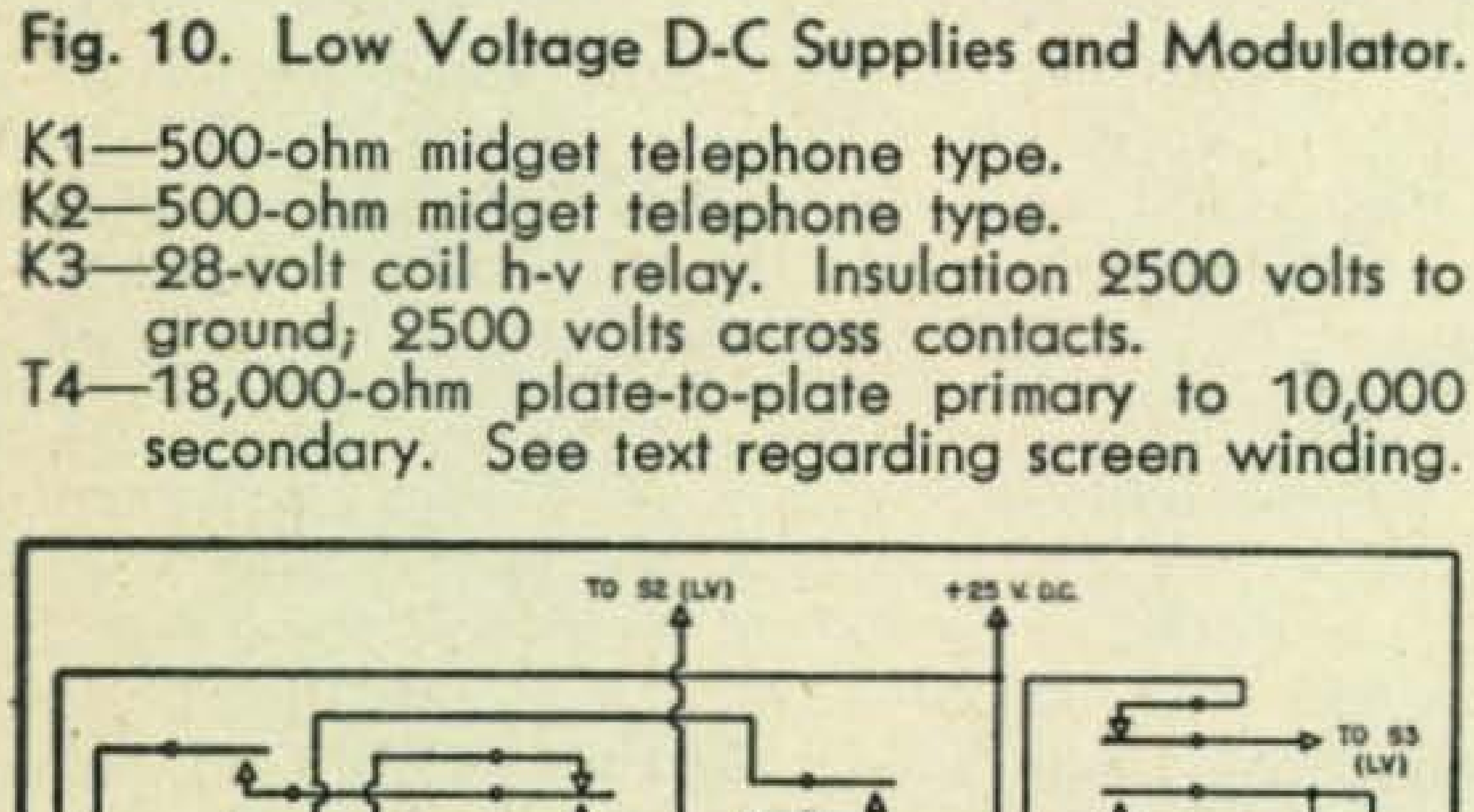


Fig. 11. High Voltage D-C Supply.

K1—28-volt coil, 5 amp. contact rating.
K2—Current relay adjusted to operate at 0.5 ampere.
K3—500-ohm midget telephone type.
K4—Thermal time delay relay, Haydon series 5900 or Advance Electric 301B.
K5, K6—28-volt coil, 10 amp. contact rating.

the relay *K8* which removes plate voltage from the 75THs, and shorts out the secondary of *T4* on c.w. On c.w. the high-voltage supply is normally on at all times, but on phone, relay *K2* actuated by the phone switch in the v-f-o unit turns high voltage on and off. This is necessary since the regulation of the high-voltage power supply causes the 75THs to draw excessive plate current without normal Class C load, and also prevents damage to the modualtion transformer without a load on its secondary. The modulation transformer, *T4*, has a screen winding, but this is not required if the screen is fed through an audio reactor of about 10 henries capable of handling about 80 ma.

The high-voltage power supply and its relay system (*Fig. 10*) is conventional. If the overload relay kicks *K2* out, overload lock relay *K3* closes, and the reset button must be pressed to obtain high voltage again. A primary tap cuts voltage in half for tuning or reduced power.

PA Details

The final amplifier (*Fig. 8*) uses a B & W butterfly tuning condenser, and the kilowatt HDVL coils and coupling link. A rack and pinion drive together with a lever arm permitted the central panel location of the link coupling knob. Since automatic tuning is used, the layout was made more conveniently across the chassis instead of front to rear. This made the 4-125A tube location favorable with respect to the 807 driver. The B & W tuning condenser was mounted on its end and the tuning motor was put on the chassis beneath it.

(*Continued on page 93*)

A New Type Capacitor

W. F. FRANKART, W9KPD*

AT VERY-HIGH and ultra-high radio frequencies the effectiveness of condenser bypassing is limited by the inherent inductance of the common type of capacitor. This inductance is the result of the type of foil winding in the condenser, the length of the foil and the length of the leads. An astute selection of lead lengths will allow a certain degree of series resonance to be utilized when employing mica type capacitors. Other types of capacitors, however, are strictly limited in their bypassing action at these high radio frequencies.

Several capacitors have been designed to overcome this effect. Some of these are great improvements and are successful in reducing the inductance effect to varying degrees. Due to the complicated mechanical configuration necessary in most models, their manufacture has been costly and impractical. Actually, the true problem has not been solved, i.e., the cancellation of the inherent inductance. A totally new approach to the problem has been disclosed in a recent application of the writer. This approach applies the bifilar wiring arrangement to the construction of condensers and may thus be used to cancel the over-all inductance throughout the capacitor.

*4225 Reed St., Ft. Wayne 5, Ind.

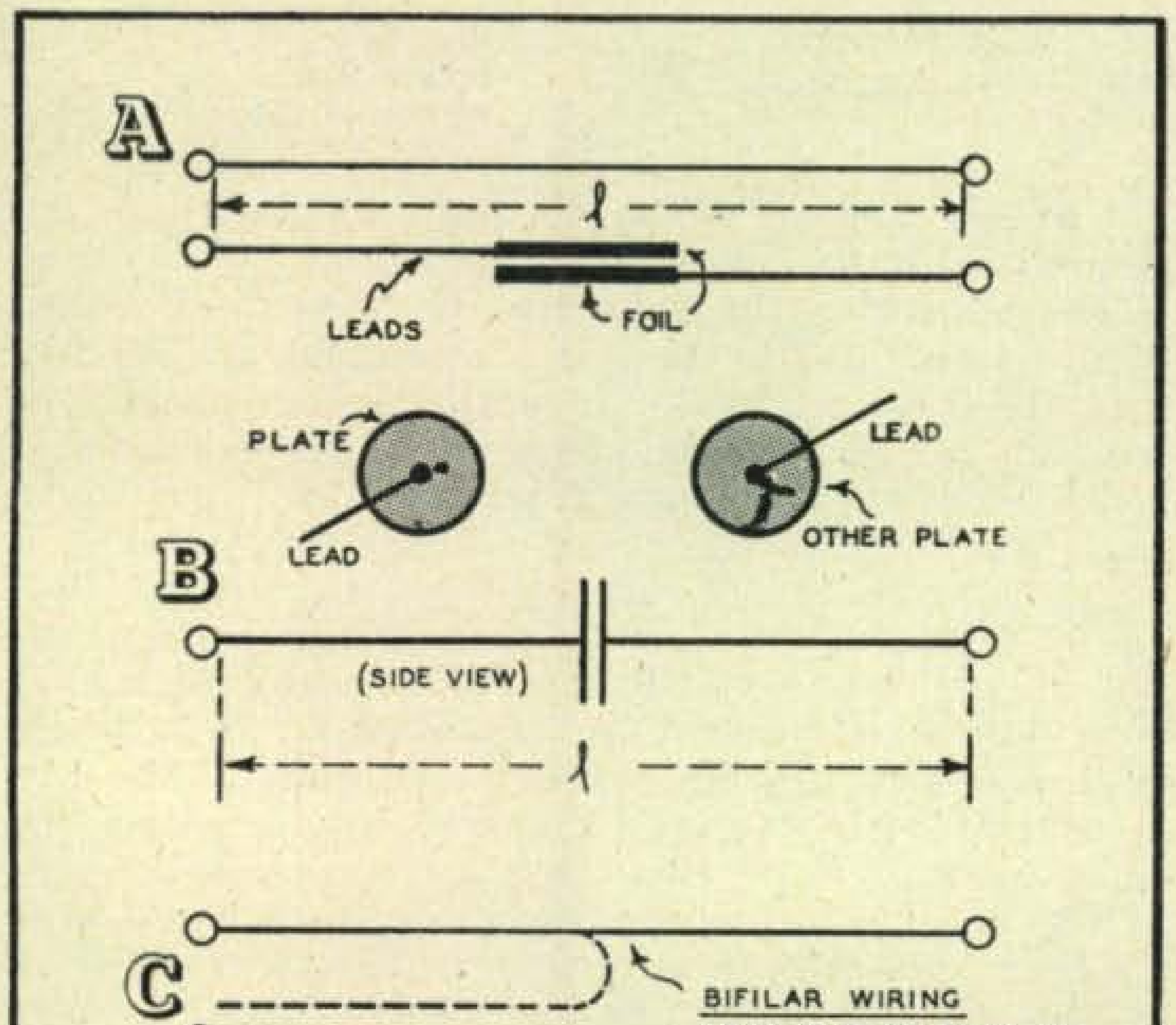


Fig. 1. The development of the bifilar capacitor was based upon the desire to reduce the inherent inductance in bypass condensers. Part D shows the electrical connections of the bifilar condenser. The length and positioning of the leads is adjusted to cancel out the inductance effect.

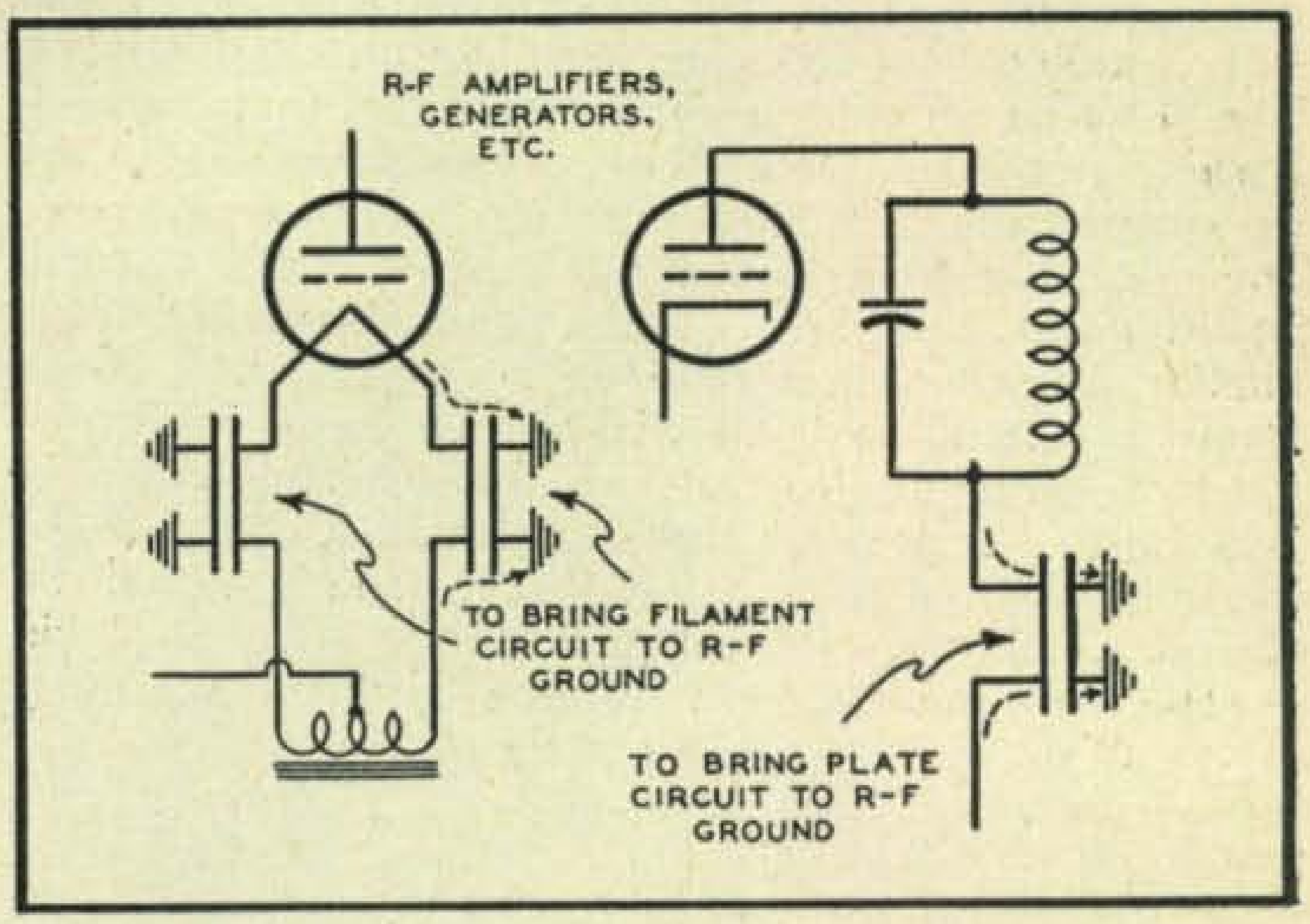


Fig. 2. The bifilar capacitor may be employed in any type circuit that uses present day condensers. It is especially useful in the type circuits as shown above.

The various steps to the solution of this problem are shown in *Fig. 1*. Drawing *A* illustrates the equivalent condenser as it appears at a high radio frequency. Part *B* shows two approaches to the problem of cancelling the inherent inductance through the use of button-type capacitors. These may be of the mica or of the plated ceramic type where the lead is center, or center and edge mounted. This brings about a small reduction in the inductive reactance of the condenser. Drawing *C* shows the method of inductance cancellation through a bifilar winding arrangement which is then incorporated in a capacitor, as shown in Drawing *D*.

The active principle in the *bifilar condenser* is the "folding-back" of the magnetic lines of force which normally create an inductance through the length of the foils and the leads. This "folding-back" action, or the bifilar wiring arrangement allows the fields to be cancelled according to the mechanical configuration of the capacitor and the leads. By constructing a condenser as a four terminal network in such a fashion that terminals are located at the ends of both foils we are able to obtain a very high degree of inductance cancellation.

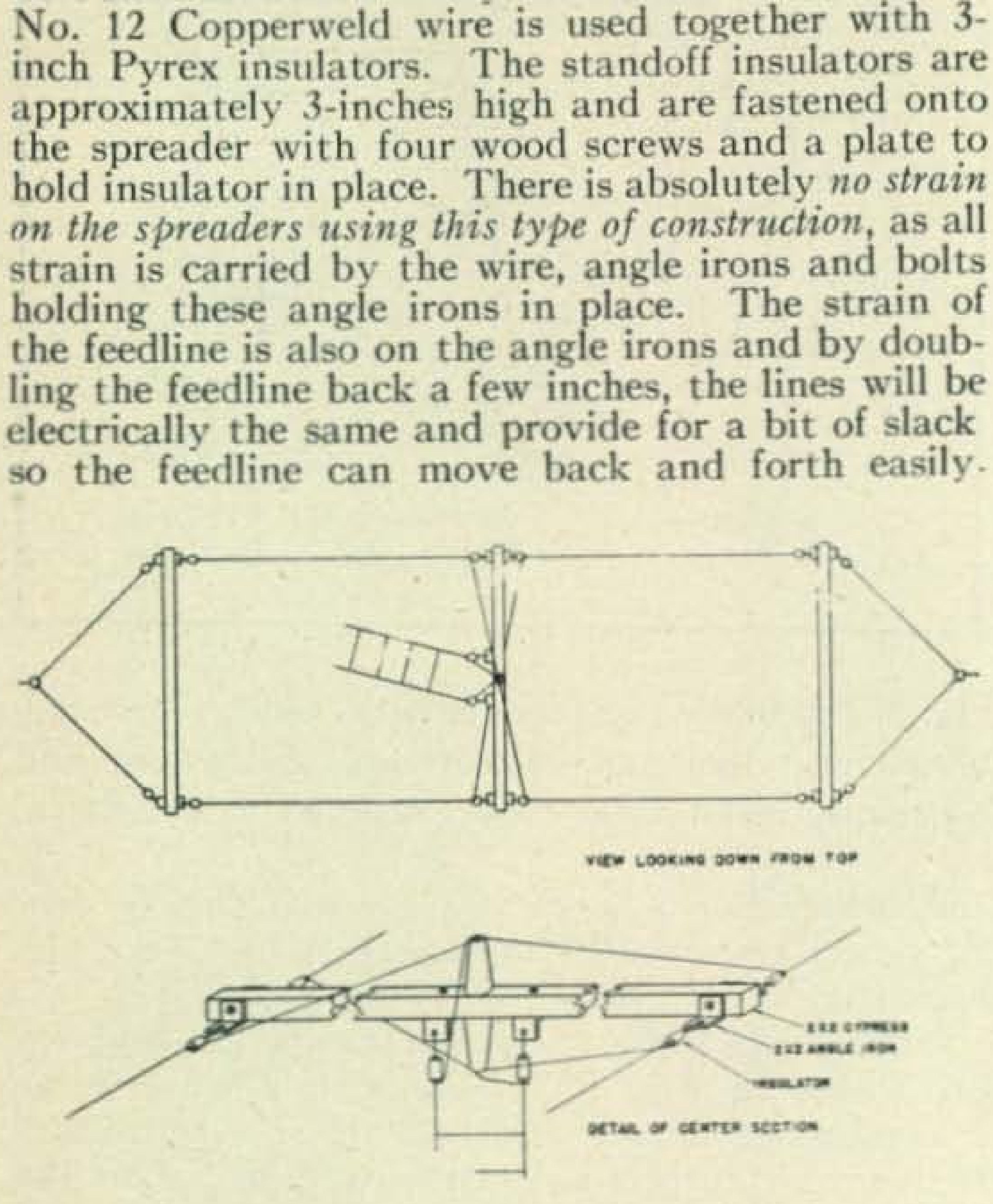
(*Continued on page 94*)

Inside the SHACK AND WORKSHOP

Conducted by A. DAVID MIDDELTON, W1CA*

The 8JK Beam

The average 8JK Beam as erected by the amateur is generally mechanically weak and will not withstand ice, snow, sleet or high windstorms. The design as submitted is one that has been time tested and will give service for years and years with no attention. Cypress spreaders 2x2 inches are used throughout. Angle irons 2x2 are bolted directly through the cypress spreaders with a 2½x¼ stove bolt and fastened securely with locknut and washer. No. 12 Copperweld wire is used together with 3-inch Pyrex insulators. The standoff insulators are approximately 3-inches high and are fastened onto the spreader with four wood screws and a plate to hold insulator in place. There is absolutely *no strain on the spreaders using this type of construction*, as all strain is carried by the wire, angle irons and bolts holding these angle irons in place. The strain of the feedline is also on the angle irons and by doubling the feedline back a few inches, the lines will be electrically the same and provide for a bit of slack so the feedline can move back and forth easily.

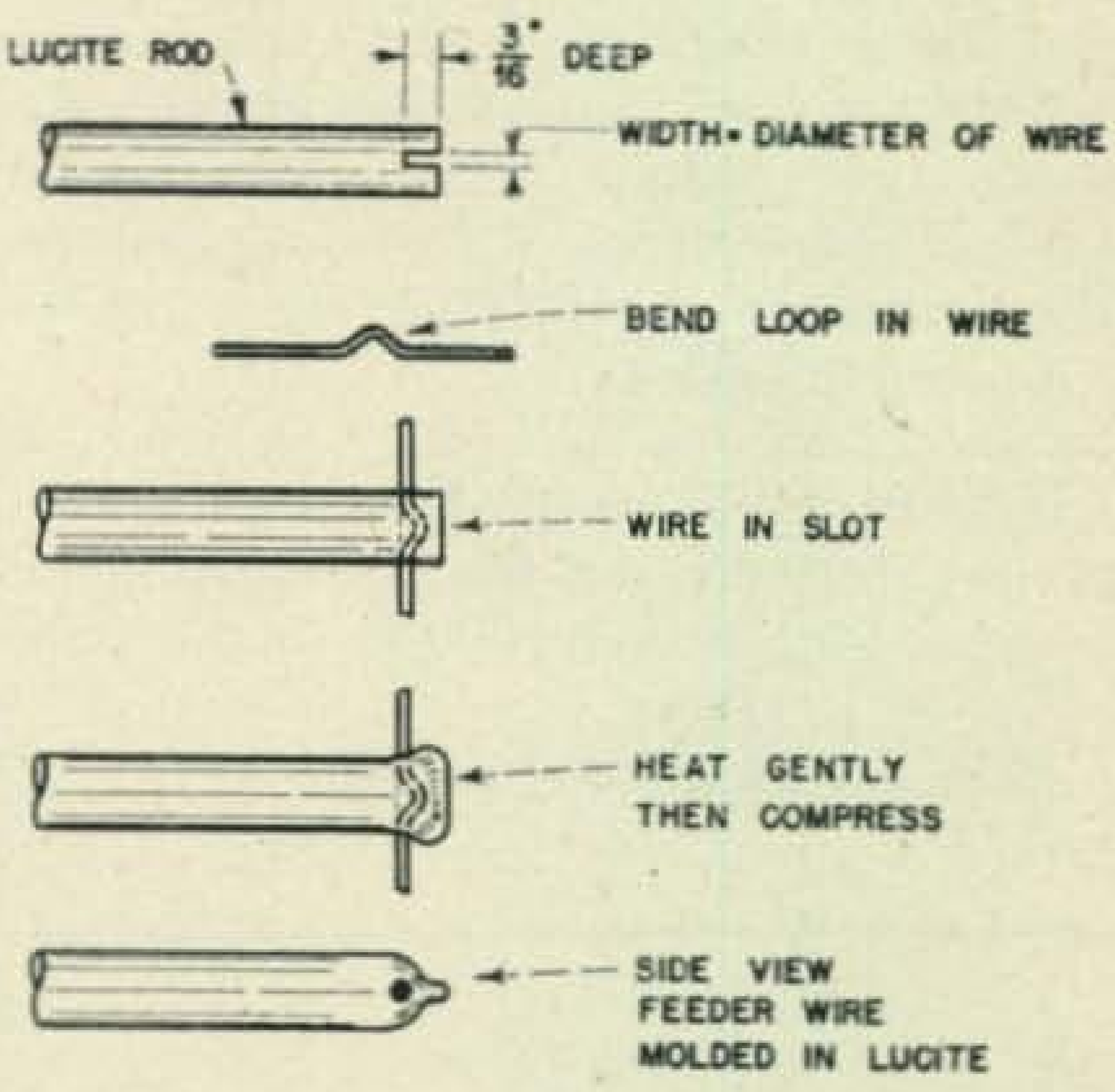


Solder *all* connections including the feedline to the antenna, rather than have any lug type connections to come loose or corrode. Extra sections may be added to this 8JK by merely eliminating the two center brackets on the spreader, but still using the two 3-inch standoffs for wires to be transposed over on the antenna itself. Extra guy wires may be added on each end of the antenna brackets so that the beam will always remain in a horizontal position and not twist or sway in the heaviest wind storm. The author has a four-section and also another two-section 8JK on 10 meters which has been giving excellent service for many years without any attention whatsoever.

Charles W. Boegel, Jr., WØCVU

Handmade Polystyrene Feeder Spreaders

After trying several of the common ways of fastening feeder spreaders to wire I evolved the method illustrated. Material for the spreaders is Lucite or Plexiglass rod, obtainable from hobby shops. Spreaders made from Lucite are strong and light, and have good electrical properties. Either 3/8″ or ½″ rod is suitable.



Cut the rod into lengths 3/8″ longer than the desired wire spacing. Into each end cut parallel slots the width of the wire diameter and about 3/16″ deep. With the wires stretched out tightly and about the right distance apart, bend a shallow loop in the wire at the point where the spreader is to be placed. Insert the wire in the slot as shown, and heat the end of the spreader gently with an alcohol torch. Take care that the Lucite does not bubble or burn. Be sure to heat the wire near the spreader. When the Lucite is soft and pliable it may be formed around the loop with a pair of pliers or the gloved fingers. Pinch the end of the rod tightly so that the soft Lucite is pressed into the open spaces around the wire.

The wire is thus molded tightly into the end of the spreader and the wire is prevented from turning by the loop in the wire. This method causes no more discontinuity in the transmission line than the usual method of wrapping wire around, and makes a light and strong job. The wire will not pull out, and the feeders will not twist or rattle in the wind. The cost is about three cents per spreader for 3″ spacing.

For those who desire a neater job, an old pair of pliers may be fitted with anvils on the jaws. These anvils may be shaped to form the Lucite neatly over the wire. Heat the Lucite, clamp with the pliers and let cool.

R. G. Talpey, W2PUD

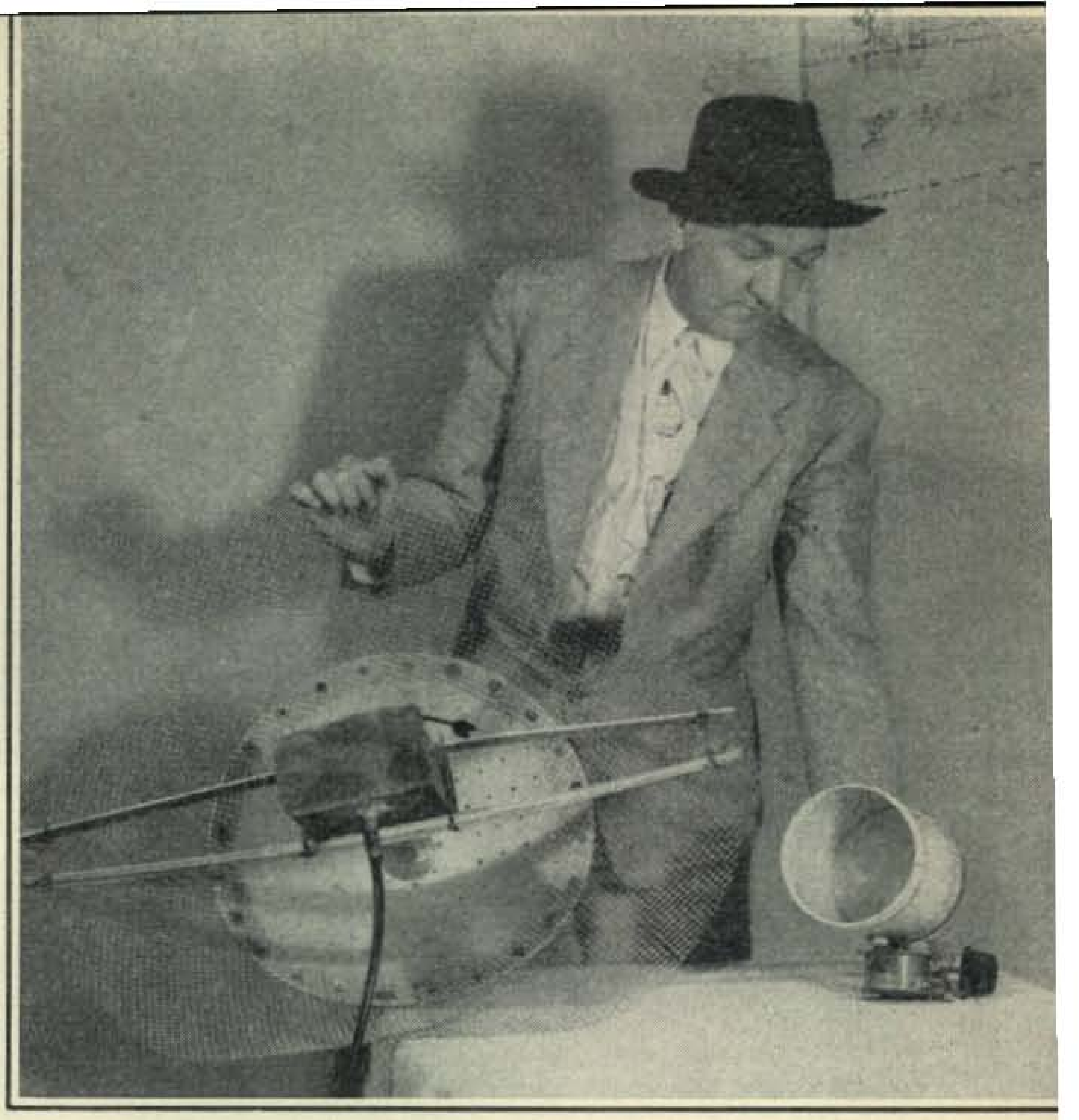
For Phone Men Only

The 75-meter "quality hounds" who are using a low-level broadcast type mike and like to talk well back from the mike often have appreciable "carrier hiss" which is generated in the plate resistor of the first speech amplifier tube. Noise from this source can be eliminated by substituting a precision *wire wound* resistor.

W. W. Smith, W6BCX

**Address all contributions to S & W Department c/o CQ, 342 Madison Ave., N. Y. 17, New York.*

W1BBM looking over the 2C40 and the cylindrical resonant cavity which form the basis for his 1215-mc transceiver. Also shown is the waveguide used to feed the parabolic dish.



Simple Transceiver For 1215 MC

B. W. BATES, W1BBM*

You don't have to be a radar expert to work on the microwaves. Here's some equipment that will do an effective job.

SINCE THE CLOSE of the war and the return of the amateur bands considerable time at W1BBM has been spent investigating amateur radio possibilities in the ultra-high frequency spectrum. Of late we have been confining ourselves to the 1215-mc band (1215-1295 mc or 23.1 to 24.7 cm).

The newer type tubes and new techniques have made operation in this band surprisingly simple. In the place of coils and tuning condensers we have substituted copper plumbing in the form of resonant cavities and waveguides. Highly directive antennas are a foregone conclusion at these frequencies and the DX possibilities are nothing short of phenomenal. Since many individual amateurs have expressed an interest in our equipment this article describes our transceiver for the 1215-mc band. As may be seen in the accompanying illustrations, this transceiver is strictly a home-brew rig. This, we can honestly say, has neither detracted from its stability nor its effective operation. As a matter of fact, at 1215 mc certain amateurs who are handy with lathes and metal turning may find the construction of resonant cavities an additional interesting hobby. In any case, the final test and getting on the air at the u.h.f. with concentrated flea-power provides a very distinct thrill of its own.

The Cavity

The 1215-mc transceiver consists of a single 2C40 which acts as an oscillator on *transmit* and as a regenerative or super-regenerative detector on *receive*. The heart of the transceiver is the disk-seal 2C40 triode lighthouse tube. The lighthouse tube is a war innovation—designed especially for operation in the microwave region. The tube name is derived from the physical appearance of the step-like structure of the tube envelope. In the 2C40 the cathode, grid, and plate are arranged in parallel planes. This reduces the lead inductance from each element to a very low value. It also permits the use of very small electrodes and small electrode areas. Thus the interelectrode capacities may be reduced to the negligible values required for efficient operation in this frequency spectrum. A 100-$\mu\mu$f fixed mica capacitor is built into the base of the 2C40 in such a fashion that the r-f cathode connection and the grid and plate are aligned symmetrically. By using a cylindrical resonant cavity the 2C40 may be made an integral part of the cavity which will completely enclose the tube and the r-f field.

The construction of the cavity is shown in the detail drawing *Fig. 1*. The cavity comprises two separate sections and is technically referred to as an *end-to-end* type cavity resonator.[1] The side walls of the cavity were made from copper tubing of a 2½" inside diameter. The inner walls are carefully cleaned and smoothed down with emery cloth. This polishing will also have an effect on the resonant frequency of the cavity and may be used to lower the frequency slightly after the unit has been completed. The cathode side wall is soldered directly to the bottom plate while the plate side wall is soldered to the top plate. Eight screws are used around the periphery of the two plates to clamp the whole assembly together.

The anode contact for the 2C40 on the top plate is a short nipple. This is drilled out to fit the 0.25 inch plate terminal on the tube. Hacksaw cuts should be made in the plane of the axis of the nipple and the four sections thus formed are bent in to make a very tight grip on the plate terminal. Two locknuts hold this nipple to the top plate of the cavity. The cathode contact on the bottom plate was especially made from a brass ring whose original inside diameter was about 1.06 inch. A hacksaw is used to cut teeth into the brass ring

**Main St., N. Harwich, Mass.*

[1]A discussion of the cavity resonator appeared in May, 1947, *CQ*, page 30.

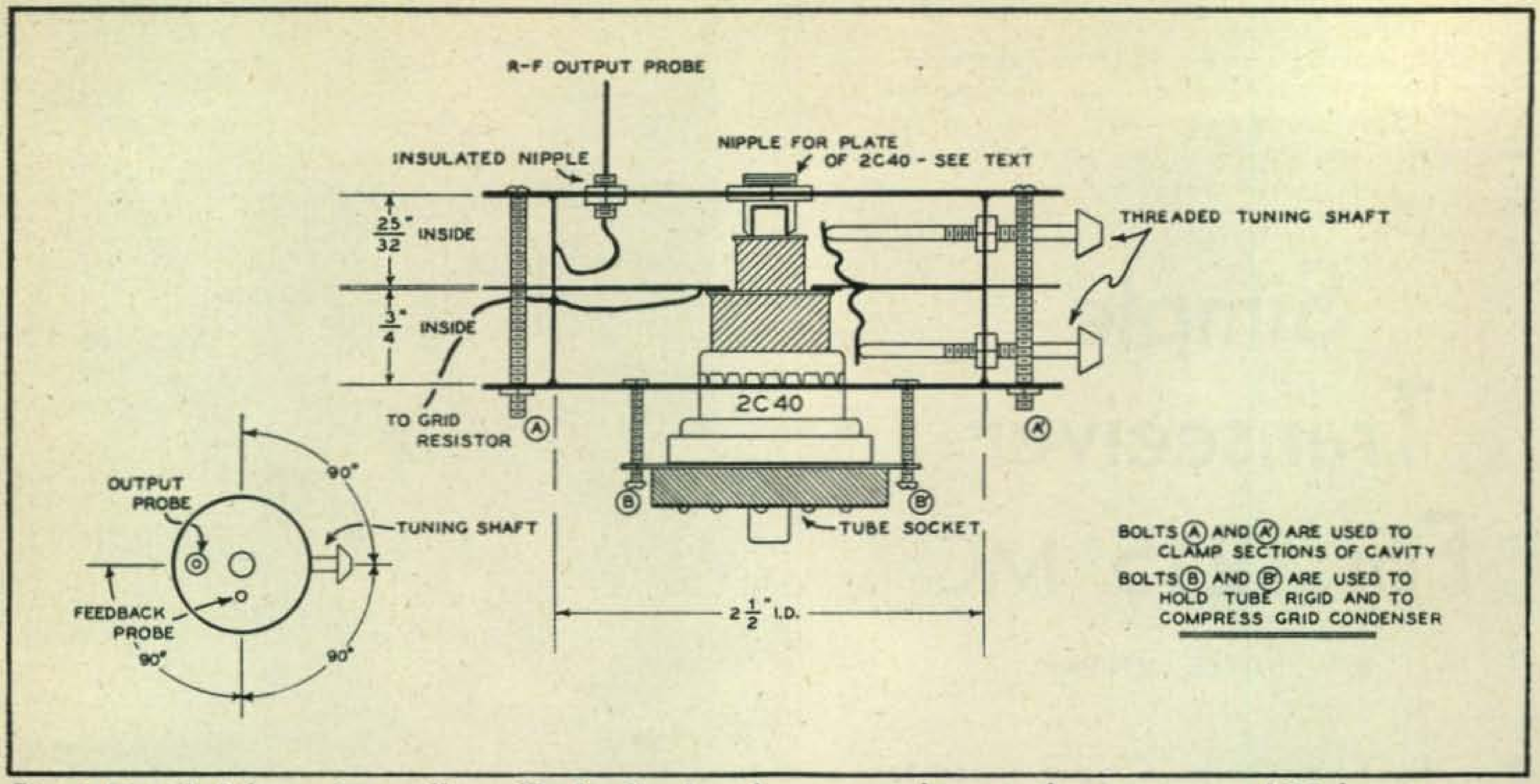


Fig. 1. Detail of the cavity oscillator. The feedback probes are not shown as they are mounted 90 degrees away from either of the tuning shafts and the output loop.

and these are bent in to form another tight grip on the tube. The brass cathode ring is soldered directly on the bottom plate of the cavity.

The center plate is a circular cut from a sheet of copper plate. A 0.65-inch hole is cut in the center of this plate to allow the plate disk seal of the tube to pass through, but not the grid disk of the 2C40. However, between this center plate and the grid disk seal goes the grid condenser. One side of the grid condenser is made of a thin brass shim with an inside diameter of approximately 0.63 inch and an outside diameter of 1.63 inch. The shim contacts the grid ring of the 2C40 but is insulated from the center plate by a sheet of mica cut in the same shape as the shim but with a little larger outside diameter. A lead is soldered to the shim and is connected to ground through a suitable grid leak. No plate condenser is used with this type of transceiver. While this allows the high voltage to be applied directly to the over-all cavity, this overcomes certain forms of r-f leakage and appears to improve the efficiency of the transmitter.

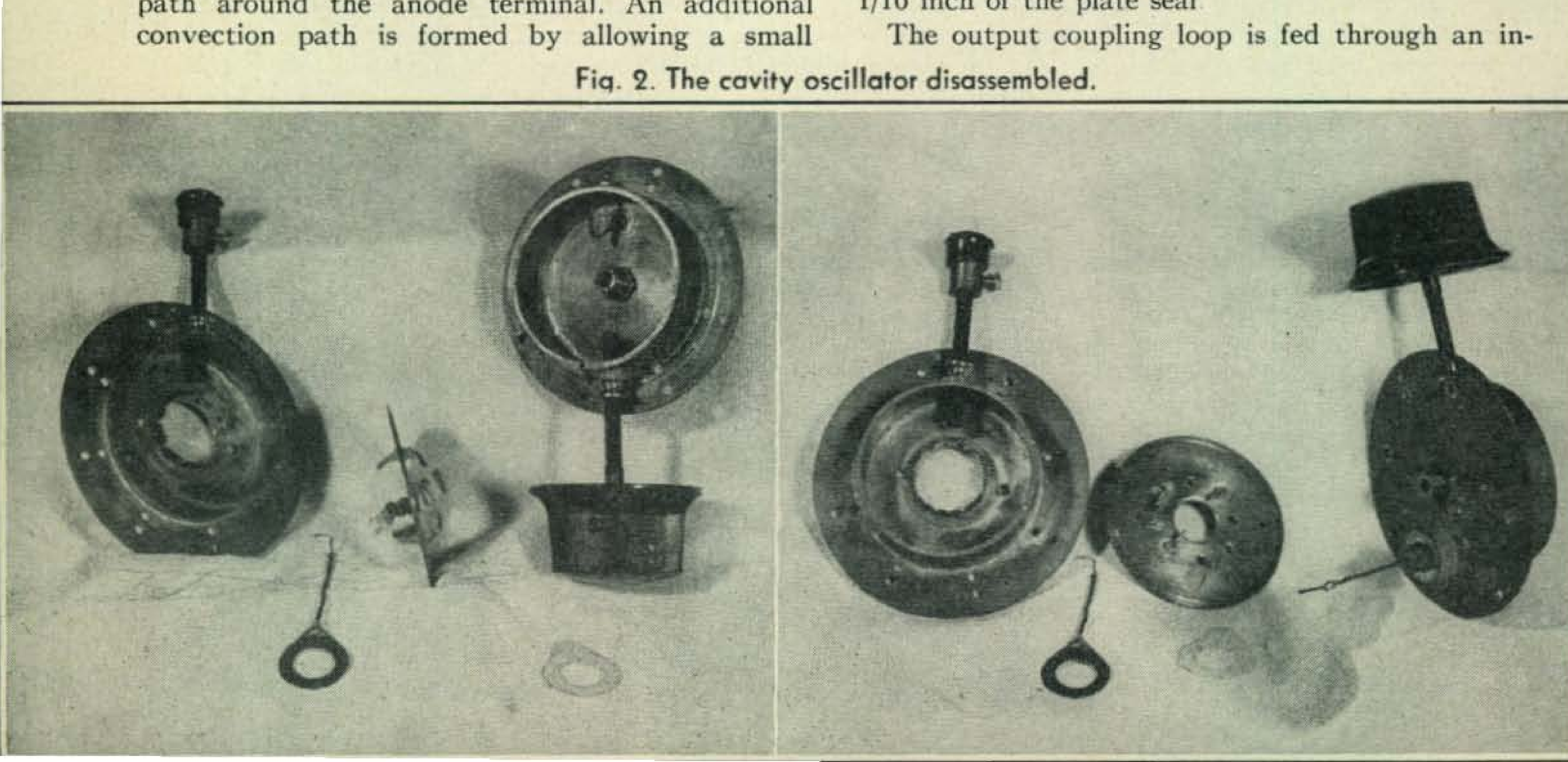
A large proportion of the heat generated by the tube is carried off through the low-heat-resistance path around the anode terminal. An additional convection path is formed by allowing a small degree of air circulation from the spring-like fingers of the bottom plate cathode connection to the nipple of the output probe in the plate section of the cavity. To complete this path it can be seen in *Fig. 2* that eight 3/32 holes were drilled in the center plate. These holes will also permit a certain amount of r-f feedback between the two sections of the cavity. The actual feedback path necessary for stable oscillation is provided by two probes.

Coupling and Tuning

When the end-to-end resonant cavity is used as an oscillator it is necessary to provide feedback from the grid-plate space to the grid-cathode space. Several methods were tried at W1BBM and the most successful has been the fixed probe feedback. The probes are made from short lengths of wire. These pass through but are insulated from the center plate. The holes should be about 1/4 inch and the probes are suspended through the center of the holes with polystyrene cement. The positioning of the probes may be somewhat critical, although the two transceivers we have built worked best with the ends of the wire probes bent to within 1/16 inch of the plate seal.

The output coupling loop is fed through an in-

Fig. 2. The cavity oscillator disassembled.



sulated 1/8-inch nipple in the top plate. The diameter of this loop is very critical for maximum signal output and must be adjusted with a field strength meter when the entire cavity and antenna have been assembled. The loop size inside the plate-grid space of the cavity can be increased and dedecreased by pushing the external probe up and down into the cavity.

The two sections of the cavity are individually tuned. This is accomplished by varying a very small capacity between the plate and the grid, and the cathode and the grid. The variable condenser is made of a short strip of 1/2-inch wide thin phosphor-bronze. One end of each of the strips is soldered to the center plate. The other end is pushed in or out near either the plate or the cathode seals by a bakelite arm which passes through a threaded nipple mounted in the side walls. The bakelite rods are threaded to about 28 per inch. The tuning tabs are mounted 90° from the feedback probes and 180° from the output coupling loop. The tabs may be clearly seen in *Fig. 2* and are also detailed in the drawing *Fig. 1.*

Fig. 3 shows the connections necessary to couple the cavity to the audio stages. The modulator is conventional and almost any low-power audio amplifier may be used. If a high output microphone is to be used it may be possible to dispense with the 6C4 first audio stage. The two filter chokes are not critical, although the one used in the modulator should have as low a resistance as possible. A 10,00-ohm resistor is shunted across the *receive* filter input choke to eliminate fringe howl. The audio bypass condensers are 0.002 μf and are used to cut off the bass response in the modulator and to limit the super-regen on RECEIVE.

On TRANSMIT the 2C40 draws about 20 to 25 ma at 210 volts. This current will vary with each value of the transmitting grid leak and applied plate voltage. The cavity is tuned by setting the plate tuning tab at minimum capacity (farthest from the plate disk seal). Then the cathode tuning tab is adjusted while carefully watching the plate milliammeter. As the cathode capacity is increased the plate current will rise and reach a very pronounced peak of approximately 30 to 35 ma. Tune through this peak until the plate current returns to the normal value of 20 to 25 ma. This is the point of highest operating efficiency. The plate tuning tab will determine the frequency of oscillation in the cavity and the frequency may be changed by detuning the plate tab and retuning for maximum efficiency with the cathode tab. This particular type of cavity will oscillate rather vigorously at this frequency. However, if the cavity is not oscillating—due to r-f leakage—the tuning tabs will not affect the plate current readings. When the cavity is oscillating practically any change

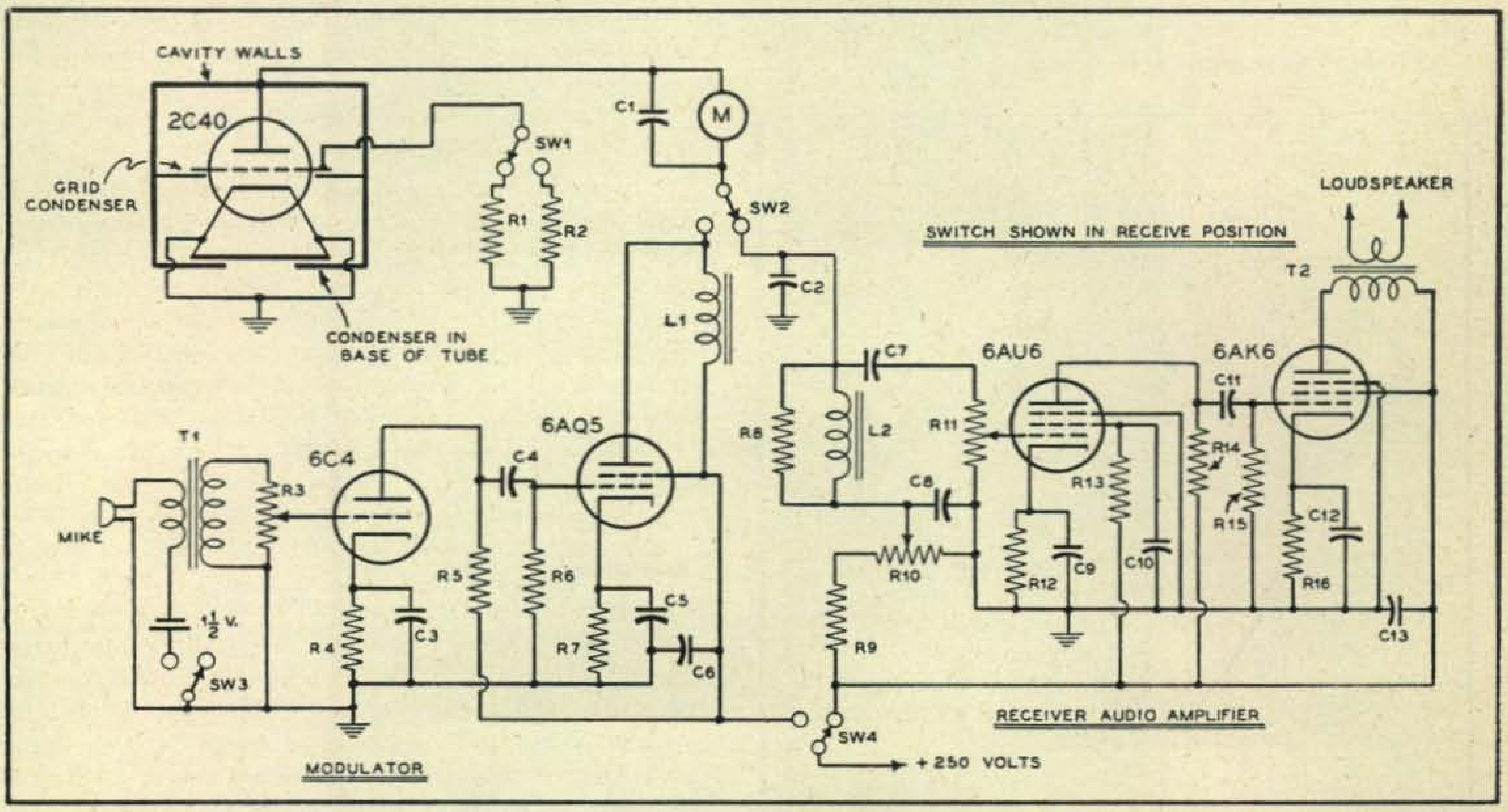


Fig. 3. Wiring schematic of the cavity oscillator and modulator-amplifier. The switches should be ganged. Any power supply with an output of 250 volts can be used.

C1—500 μμf, mica.
C2, C4, C7—.002 μf, mica.
C3, C5, C9, C12—25.0 μf, electrolytic.
C6, C8, C13—8.0 μf, electrolytic.
C10, C11—0.1 μf, paper.
R1, R8—10,000 ohms, 1 watt.
R2—50,000 ohms, ½ watt.
R3, R11—500,000 ohms, pot.
R4—2500 ohms, 1 watt.
R5—250,000 ohms, ½ watt.
R6, R14, R15—500,000 ohms, ½ watt.
R7—400 ohms, 1 watt.
R9—25,000 ohms, 2 watts.
R10—20,000 ohms, wire wound.
R12—1500 ohms, 1 watt.
R13—1.0 meg., ½ watt.
R16—700 ohms, 1 watt.
T1—Carbon mike transformer.
T2—Loudspeaker output transformer.
M—0-40 ma meter.
L1—Filter choke with d-c resistance of about 200 ohms.
L2—Filter choke.

in the tuning tabs will change the plate current readings.

In our experiments a 10,000-ohm grid leak was used on TRANSMIT and a 50,000-ohm grid leak was used on RECEIVE. The cathode-grid tuning tab is not used when operating the cavity as a receiver. All tuning is done with the plate-grid tuning control. The regeneration is controlled by the 20,000-ohm potentiometer in the B+lead.

If sufficient care has been taken in the construction of the cavity the transmitter should work immediately. It is particularly necessary to be sure that there is no leakage around the periphery of the cavity. This means that the soldered portion of the cavity should be air-tight and the center plate should be fashioned to make a very snug fit. The 2C40 is drawn up into the cavity with extention bolts from the bottom plate to the tube socket. The pressure here should be equalized as this will press the grid condenser together. If the cavity has any leakage it may stop oscillation or reduce the efficiency on both TRANSMIT and RECEIVE.

Coupling to the Antenna

It will probably be found necessary to use a matching device between the antenna and the cavity. Our first efforts in connecting the RG8U coax cable directly into the cavity resulted in a very poor match. This was indicated by the dead spots in the receiver tuning.

When the antenna was disconnected and a short length of waveguide was fed with a probe directly from the cavity it was found that the loading characteristic was nearly flat. With this arrangement the whole band could be tuned without the appearance of any dead spots. With one end of the waveguide section open and used with a flare type horn this makes a fairly efficient portable outfit.

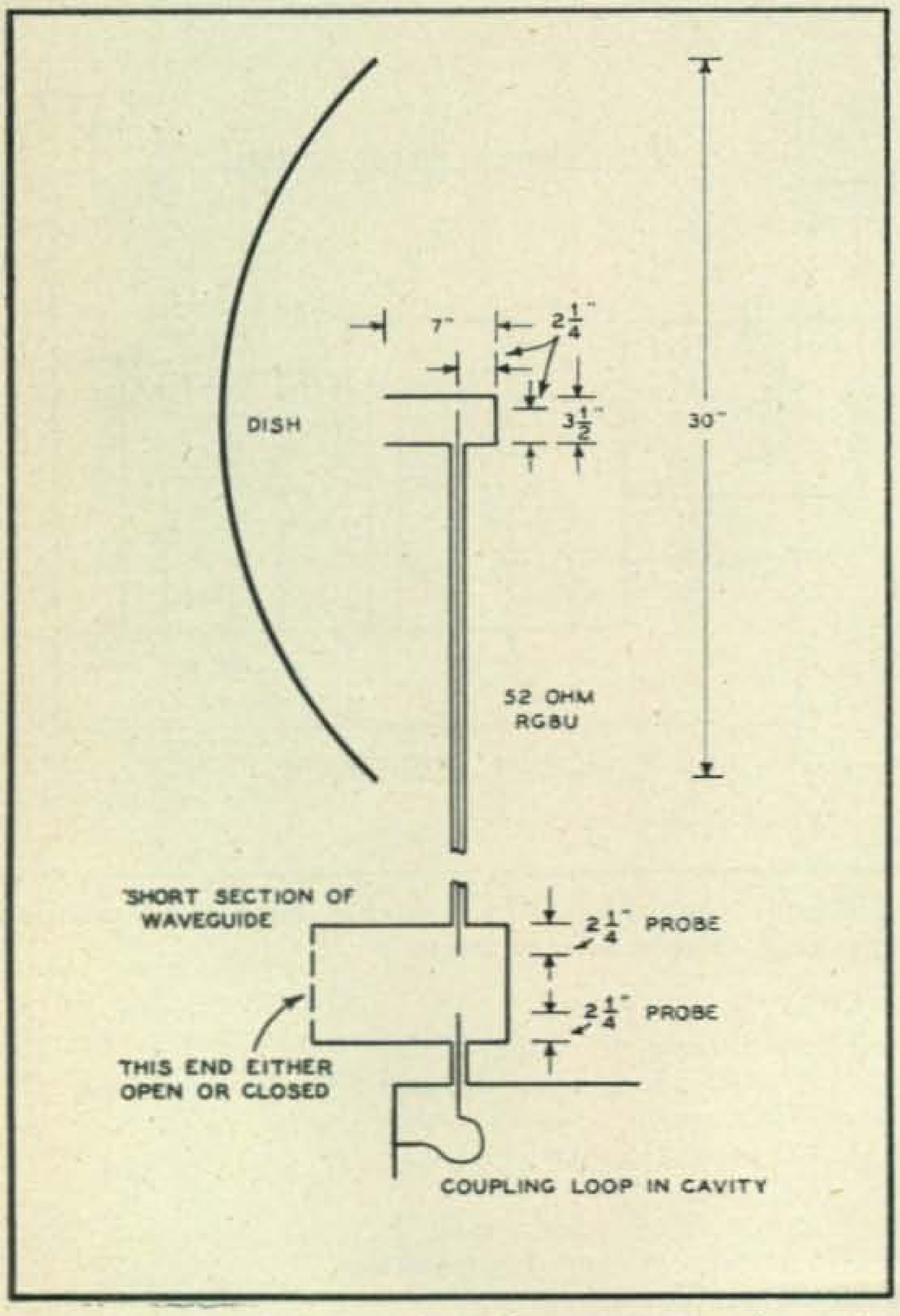


Fig. 4. Method of coupling the antenna to the cavity oscillator.

Enclosing the whole waveguide section and connecting it to the RG8U cable, as shown in *Fig. 4*, did not upset the loading. Therefore, we were using the waveguide section as a type of matching device. Basically, it should be possible to couple directly to the coax line without the waveguide section. However, on this frequency the length of the probe in the cavity is so long that it does not coincide with the electric field.

Using the waveguide alone should result in a gain of about 8 to 10 db. Adding the horn with a flare of about 50 degrees will give a gain of about 20 db if it is 30 inches long. The horn has certain advantages since it is easier to build and is fairly broad-band in characteristic. On the other hand, it is very bulky and for a given diameter the parabolic dish will give a slightly higher gain. The horn has no pronounced side lobes, the dish will have some side lobes, but these can be kept down to less than 10% of the main field. Either square or conical horn has the same gain.

A rectangular waveguide (7 x 7 x 3½) is used in front of the dish. This is used in preference to the simple dipole and reflector or disc reflector and has proven to be equally or more efficient than either of these two methods. All fixed probes extend 2¼ inches in the waveguide sections.

The final coupling adjustments should be made with a field strength meter. A simple field strength meter may be constructed from a dipole having 2¼" quarter-wave arms and a 1N21 crystal in the center. The crystal is shunted with a 0-1 ma meter. It should be possible to obtain a full scale deflection about 12 feet in front of the waveguide section. The focal point of the dish is also set with the field strength meter. This is a rather simple matter involving the checking of the side lobes and the strength of the forward or main lobe.

Operation

The results with the 1215-mc transceiver have far exceeded our expectations. Using 4.2 watts input to the 2C40 it has been possible to burn out the pink bead pilot lamps when placed directly in front of the mouth of the waveguide. When the transmitter was coupled to a 30-inch dish we found that we could drive the needle off scale on our field strength meter which was about 150 feet distant. On RECEIVE, it is possible to hear in the loudspeaker the click of a nail file being touched to a resonant length of wire—four and one-half inches long—in front of the 18 inch dish over 300 feet away. A similar experiment carried out on 425 mc could only be heard within 78 feet of the receiver.

Straight regeneration in the receiver was used in the above tests. This appears to give a much better signal-to-noise ratio than can be obtained

(*Continued on page 94*)

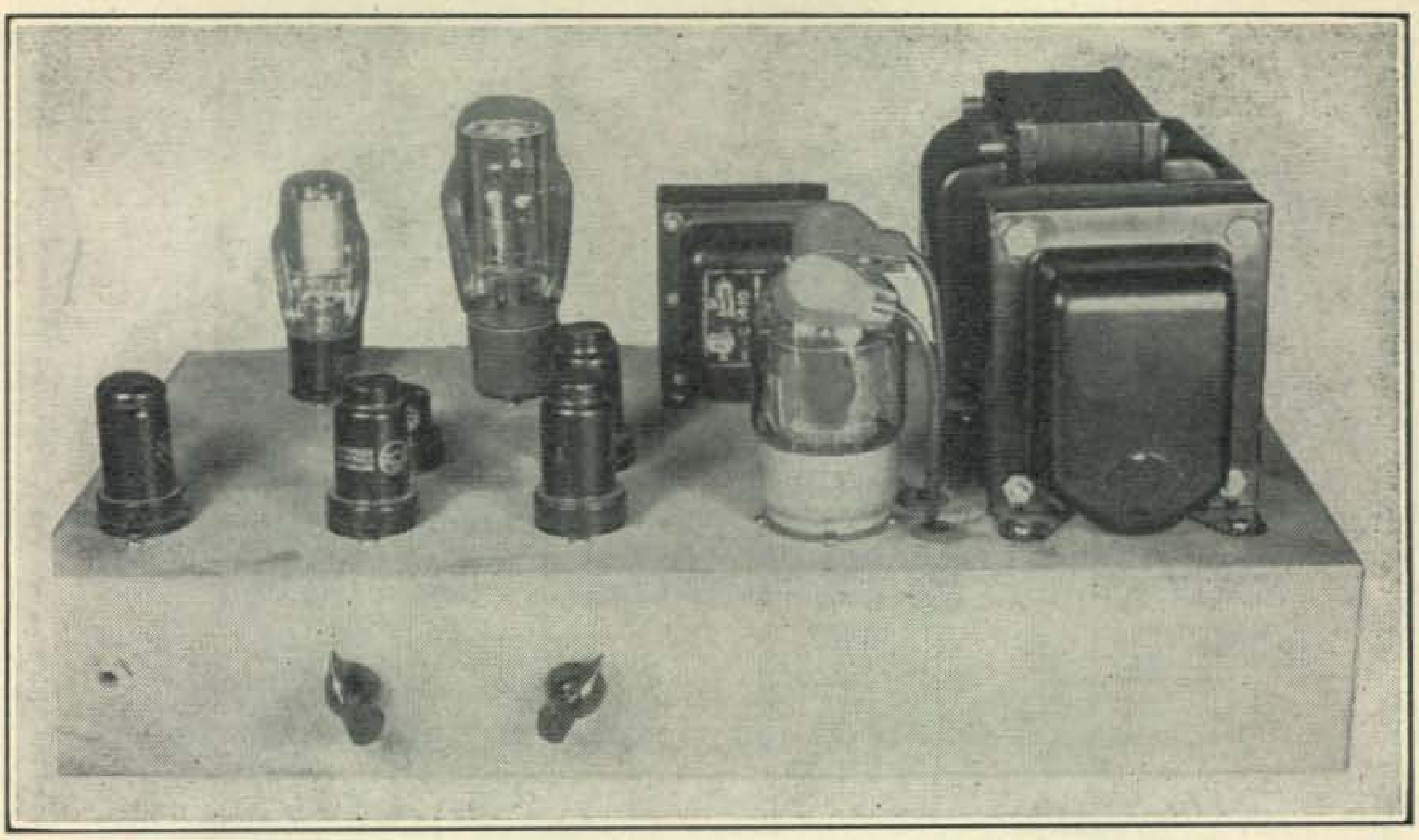


Fig. 1. Over-all view of the modulator, with cover removed.

An Economical 50-Watt Modulator

RUFUS P. TURNER, W1AY*

THE TYPE 815 dual beam tube, now an old hand in amateur radio, makes possible a small, self-contained, low-cost 50-watt modulator. The audio possibilities of this small-sized tube in Class AB_2 service are overlooked by many transmitter builders.

The 8-tube modulator unit described in this article employs an 815 in the output stage to give a measured power output of 50 watts. Full a-m-c operation is provided, and the entire unit, including the power supply, is built on a single 17″ x 10″ x 3″ metal chassis. The author's model employs a single "foundation-type" dust cover of perforated steel, 17″ x 10″ x 10″ in size, but panel-and-chassis construction and "dishpan" mounting are equally feasible. Sufficient over-all gain is provided to accommodate any of the crystal microphones commonly employed in amateur work, and the modulator will be suitable for use with any plate-modulated Class C amplifier having 100 watts input.

Circuit Description

The first stage employs a 6SK7 running wide open and with constants for high gain. The suppressor of this tube receives the a-m-c bias. The intermediate stage containing manual gain control *R6*, comprises a single 6J5 section transformer coupled to the succeeding 6J5 push-pull driver stage. The 815 output stage is operated at −15 volts fixed bias obtained from a tap on the power supply voltage divider, *R21*. A multimatch type output transformer permits coupling to any one of a variety of Class C plate impedances.

Automatic modulation control bias is obtained by rectifying a portion of the audio voltage presented to the 815 grids. The plates of the 6H6 a-m-c rectifier are connected to opposite ends of the secondary winding of the 815 input transformer through the resistor-capacitor combinations, *C11-R9* and *C12 R10*. Potentiometer *R16* permits adjustment of the a-m-c threshhold.

Screen voltage to the 815 tube is regulated by means of the OD3/VR150 tube in the power supply section. Regulation of this voltage is very important to full power output.

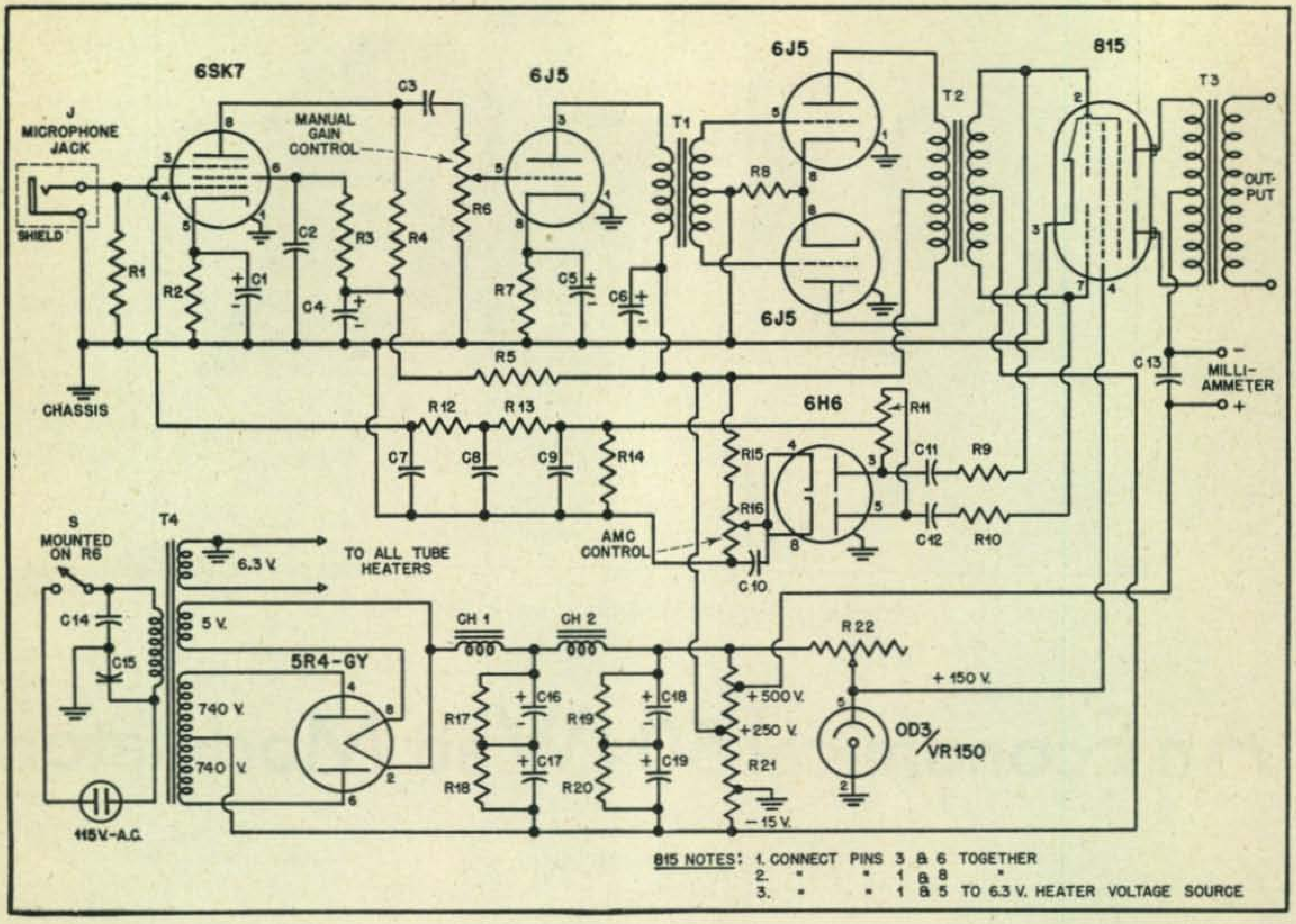
The various separate voltages required by the low-level and output stages are obtained from taps on the power supply voltage divider, *R21*.

The power supply section comprises power transformer *T4*, filter chokes *CH1* and *CH2*, filter capacitors *C16* to *C19*, and the voltage divider. The rectifier tube is a 5R4-GY and the screen voltage regulator an OD3/VR150. The electrolytic filter capacitors are series connected for higher working voltage and each is shunted with a 0.5-megohm resistor (*R17* to *R20*) to equalize voltages across these capacitors. Resistor *R22* limits the current through the regulator tube.

Rear-chassis terminals are provided for the output leads from modulation transformer *T3* and for an external 0-200 d-c milliammeter. Capacitor *C13* bypasses the meter for r.f.

It is recommended that the reader planning to duplicate this modulator use the identical component values specified in *Fig. 2*. Substitutions may be made in the case of the chokes and transformers specified,

*P.O. Box 345, New Bedford, Mass.



C1—20 μf, 50 volts, electrolytic.
C2, C7, C8, C11, C12-0.1 μf, 400 volts.
C3—0.01 μf, 400 volts.
C4, C6—8 μf, 450 volts, electrolytic.
C5—20 μf, 50 volts, electrolytic.
C9—0.25 μf, 400 volts.
C13—0.005 μf, mica.
C14, C15—0.1 μf, 200 volts.
C16, C17, C18, C19—20 μf, 450 volts, electrolytic.
J—Midget open-circuit phone jack with shield can.
R1—5 megohms, ½ watt.
R2—2000 ohms, 1 watt.
R3—2 megohms, ½ watt.
R4—500,000 ohms, 1 watt.
R5—50,000 ohms, 1 watt.
R6—1-megohm potentiometer.
R7—1500 ohms, 1 watt.
R8—750 ohms, 1 watt.
R9, R10—1½ megohms, 1 watt.
R11—200,000 ohms, ½ watt, center tapped (two 100,000-ohm units in series).
R12, R13—250,000 ohms, ½ watt.
R14—100,000 ohms, ½ watt.
R15—100,000 ohms, 1 watt.
R16—50,000-ohm wirewound potentiometer.
R17, R18, R19, R20—500,000 ohms, ½ watt.
R21—100,000-ohm 100-watt wirewound resistor with 3 sliders.
R22—25,000-ohm 100-watt wire wound resistor, 1 slider.
S—SPST toggle switch, mounted on gain control R6.
CH1, CH2—15 h., 200-250 ma. (Stancor C-1410).
T1—Interstage audio transformer 2:1 ratio (Stancor A-62C).
T2—Driver transformer (Stancor A-4712).
T3—Multimatch output transformer (60 watts) 200 ohms plate-to-plate to Class C load (Stancor A-3893).
T4—Power transformer: 740-0-740 v., 275 ma; 5 v., 3 amp. 6.3 v., 7 amp. (Stancor P-6315).

provided the components used have the same electrical characteristics as those listed.

Mechanical Construction

The modulator is not a complex piece of apparatus. Its assembly therefore is quite simple. In building this equipment, it is necessary only to follow the usual rules of good electrical construction—that is, mount components in such a way as to prevent undesired electrical coupling, and keep all leads as short and direct as practicable. Extensive shielding of leads will not be necessary, although it is advisable to enclose the microphone jack, *J*, in a small tight-fitting shield can and to cover the lead from the jack to the No. 4 contact of the 6SK7 tube socket with shield braid throughout its entire length. This braid also must be bonded to chassis at both ends of the lead.

Magnetic fields from transformers and chokes usually cause much trouble in ham-built modulators. With this in mind, the author oriented these components on the chassis to obtain the best electrical positioning. The best core directions are indicated in the photo. Transformers *T3* and *T4* and filter choke *CH2* are mounted on top of the chassis. Transformers *T1* and *T2* and filter choke *CH1*, all being smaller-sized units, are mounted under the chassis with their cores at right angles with respect to each other.

The microphone jack and the two potentiometers are mounted through the front lip of the chassis. For simplicity, the ON-OFF line switch has been attached to the manual gain control. If the reader desires, he may include a separate toggle switch.

For safety to the operator, the top caps of the 815 are provided with insulated grips, and heavy insulated leads from these connectors pass through grommet-lined holes in the chassis to the output transformer terminals.

Adjustment and Operation

After completing the wiring, the first adjustments must be made in the power supply section. The three sliders on resistor *R21* must be set with the aid of a high-resistance d-c voltmeter to the voltage values (measured between slider and chassis) indicated on *Fig. 2.* When making this adjustment, keep gain control *R6* at minimum and set *R22* to maximum. The 500-volt slider must be set finally under load; that is, with the 815 drawing full load under excitation. This will be explained later.

After the three sliders on *R21* have been set preliminarily, connect a 100-watt wirewound resistor, having the same value in resistance as the intended Class C final amplifier plate impedance, to the modulator output terminals. Set a-m-c control *R16* to minimum, plug in a microphone and (with power off!) connect a 0-200 d-c milliameter to the meter terminals on the back of the chassis. Advance gain control *R6* and whistle a constant tone slowly into the microphone, noting the amount of upswing of the milliammeter. (This should not exceed 150 ma on peak.) Temporarily open the lead between pin 2 and ground on the OD/VR150 regulator tube and connect a 0-50 or higher d-c milliammeter from pin 2 to ground. Adjust the position of the slider on *R22* so there is less than 30 ma flowing with the r-f gain control turned to minimum setting. With the gain control fully advanced and maximum speech level fed through the amplifier, the current through the VR150 should not drop below 8 ma. Note whether the voltages change at the taps on *R21* when the modulator is in actual operation. It is very likely that these voltages, especially the 500-volt value, will fluctuate during operation, and the sliders must be reset for exact voltages under these operating conditions.

When all adjustments have been made properly, the three voltages delivered by *R21* will be reasonably constant under load; that is, when speaking into the microphone. The 815 screen voltage will hold to 150 and the 815 plate current will kick up to 150 milliamperes.

The modulator should be connected to the r-f portion of the transmitter, and an oscilloscope, if available, set up for trapezoidal patterns, provided for adjustment of the a-m-c section of the modulator. Advance gain control *R6* to about half maximum and whistle or hum a sustained tone into the microphone, noting the modulation percentage as indicated by the oscilloscope pattern. Find the setting of *R6* for slightly more than 100% modulation. Now, advance the a-m-c control, while continuing to whistle into the microphone. At the proper setting of *R16*, especially in relation to the setting of *R6*, a-m-c action will maintain a level modulation percentage (as observed on the oscilloscope screen), although the operator may whistle or speak loudly or softly. It is best not to adjust for exact 100% average modulation, but rather to set gain control *R6* for a slightly lower value, giving best freedom from distortion as evidenced by listening tests with a simple phone monitor.

M. V. A. R. C. Fire Net

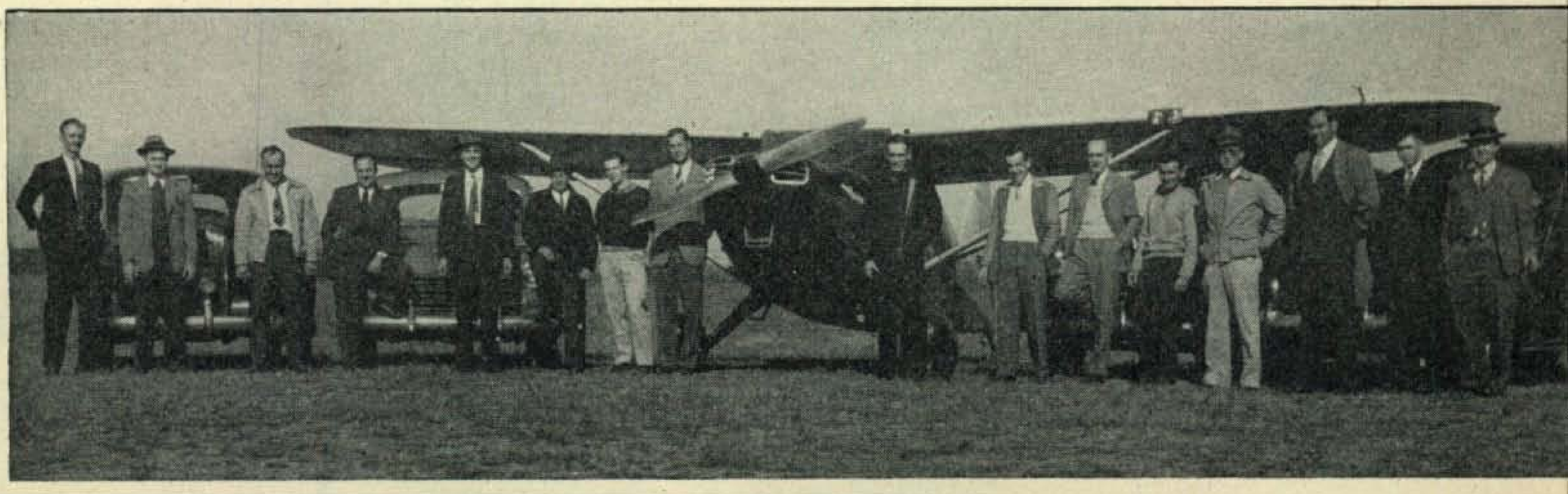
WANTED: One person in the Merrimack Valley section of Massachusetts who will make a fuss because hams are interfering with reception on broadcast sets . . .

Seriously, since members of the Merrimack Valley Amateur Radio Club performed such fine work during the recent forest fire emergency, residents are no longer disposed to argue about faulty reception that might be caused by amateur radio activities. Fire department authorities, conservation officials and the general public were loud in their praise of the results accomplished by club members in spotting fires and directing the flow of fire-fighting equipment via their ham stations during the emergency.

Using a Stinson 150, club members flew over the fire area twice daily and performed heroic service for the communities affected. Mobile cars also were used to speed to fire scenes with information received from the plane above. Approximately 100 emergency messages were handled and relayed to forest wardens. Club members also reported ten fires which had not been spotted previously, and as a result, equipment sent to these locations averted further conflagration.

The club is now on top listing of units to be commandeered by officials in the event of future emergencies.

Members of MVARC who participated in the Massachusetts fire net. Left to right: Witkiewicz, W1KNU; McAndrew, W1BLO; Wilkinson, W1CRW; Simone, W1QIT; Loeffler, W1PFA (ground control station); Hart, W1LBM; Sharkey, no call; Waldo Holcombe (owner and pilot of plane); Nilus, W1NZS (worked aircraft portable); Bembe, W1QGH; Cookson, W1MQN; Sevigny, W1IGO; Ingalls, W1JDK; Lesure, no call; Arnfield, W1NNG; Krukonis, W1CBY.



Monthly DX Predictions - February

OLIVER PERRY FERRELL*

A QUESTION has arisen as to whether there is a monthly or seasonal variation in the lowest usable frequency. The LUF is shown in the accompanying graphs as the shaded area. The answer to this question is —yes. There is a constant (even day-to-day) variation in the amount of absorption and the LUF. As mentioned in previous columns the LUF is based upon field strengths. Also included in the calculating of the LUF are factors of the length of the path, latitude and longitude of the control points of the path (i.e., locations of ionospheric reflections), hour angle of the sun as well as ascension, frequency of transmission, effective radiated power and receiver sensitivity.

The principal daylight absorption of energy occurs in the D-region at a height of about 50 miles in the ionosphere. Since the ionization at this level is created through action of the ultra-violet light from the sun it has been found that ionization and absorption (the atmosphere is relatively dense when compared to the rest of the ionosphere) vary practically in step with the amount of sunlight incident upon the D-layer. Some absorption is caused by ionosphere storms, but this type of absorption is exceedingly variable and little is known at present concerning its nature. This absorption of radio energy may be calculated in advance. It does vary both seasonally and monthly due to the position of the sun.

Graph 1 shows the predicted median conditions over a path from the W6-W7 call areas to eastern India and Burma. The shaded area shows the usable frequencies for the times along the bottom scale. These are calculated on the basis of an effective power radiation of 1000 watts. In general, the lowest usable frequency (LUF) is slightly higher than necessary for weak signal c-w work. It is also probably somewhat conservative (i.e. the frequencies should be slightly higher) when phone transmission is attempted. The LUF is a factor determined by the rate of signal absorption and is largely independent of the maximum usable frequencies (MUF). As shown in *Graph 1* the MUF at midnight PST will probably be about 17 mc, at the same time the LUF will be about 10 mc. This indicates that the only amateur band open over this path would be 20 meters. As the LUF drops down, the 40-meter band will open about 0130 PST. 20 meters should be weak with only scattered signals until 0330 PST when the band should close completely. The 20-meter band will reopen sharply around 0730 while 40 meters after being open all night will close at about 0900 PST. 20 meters will close again after 1300 hours PST until 2230 PST. The 10-meter band will probably open at 1630 hours PST with fair to good signals until 1915 PST.

In *Graph 2* the median conditions from the W8, W9 and WØ call areas to Italy and surrounding Mediterranean countries are shown. At midnight CST the only band open across this path for amateur work would be 40 meters. The 20-meter band will open with scattered signals around 0300 hours CST while 40 meters will close at 0400 hours CST. 20 meters will then close after 0645 CST at which time it is expected that the 10-meter band will open. Peak time for the 10-meter band is around 1000 CST and the closing is predicted for about 1330 CST. 20 meters should reopen around 1100 hours CST with weak signals and close after 1700 CST. Some variation is expected over this path since it passes near the edge of the northern hemisphere auroral zone. On disturbed days the 20-meter signals will be weak and accompanied by considerable fading. 10 meters on these days may not open.

Excellent high-frequency conditions are predicted over certain paths into the Far East and Australiasia. *Graph 3* illustrates the predicted conditions from the W9 and WØ call areas as well as portions of the western W4 and northern W5 areas to the Philippine Islands. At midnight CST the MUF should be about 19 mc. The LUF will probably be about 12 mc. The 40-meter band should open after 0130 hours CST, while scattered 20-meter band signals will most likely be heard throughout the night. Good 20-meter band conditions are predicted from 0830 to 1130 hours CST. A 10-meter band opening will probably occur between 0930 and 1215 hours CST. Conditions then drop out with the 20-meter band closing down after 1300 hours and not reopening until after 2200 hours CST. A second 10-meter band opening is indicated for 1645 hours. The peak MUF of this second opening may go as high as 41.0 mc. 10 meters will then close after 2200 hours and the 20-meter band may reopen around 2330 hours CST.

Graph 4 shows the median conditions over a path from the W1, W2 and W3 call areas to eastern Australia. At midnight EST the predicted MUF is 20-mc. The predicted LUF is about 11 mc. The lowest MUF during the night is only about 15 mc. This seems to indicate that some scattered signals will probably be heard on 20 meters during this period. The 40-meter band is expected to be open from 0130 hours until 0900 hours EST. Fair to good conditions on 20 meters are predicted between 0730 hours and 1000 hours EST. The 10-meter band should open around 1400 hours, although good signals and peak conditions are not expected until about 180 hours EST. Closing time for 10 meters is about 2100 hours the 20-meter band may reopen after 2330 hours EST.

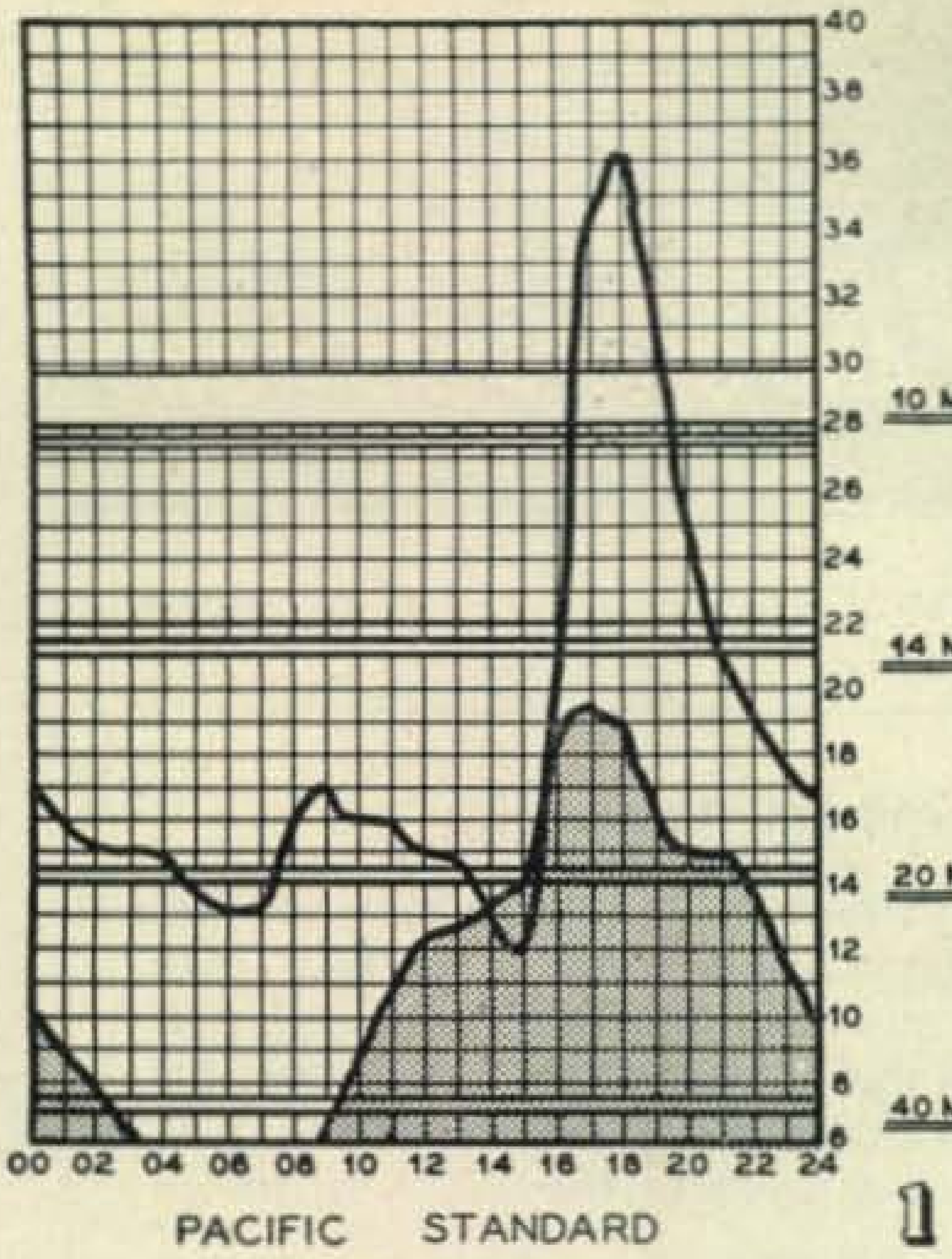
Forecast of Disturbances

From a long-range analysis it would appear that the most probable periods of ionospheric disturbances would be February 4 to 7, February 23 to 25, and February 28 to March 2. These disturbances are of the ionospheric storm type which are characterized by low-signal strength, a low value of MUF and excessive fading.

The data for the graphs is obtained from the CRPL. The MUF figures are drawn from the booklet "Basic Radio Propagation Predictions for February (Three Months in Advance)." These are obtainable on a subscription basis from the Superintendent of Documents, Washington 25, D.C.

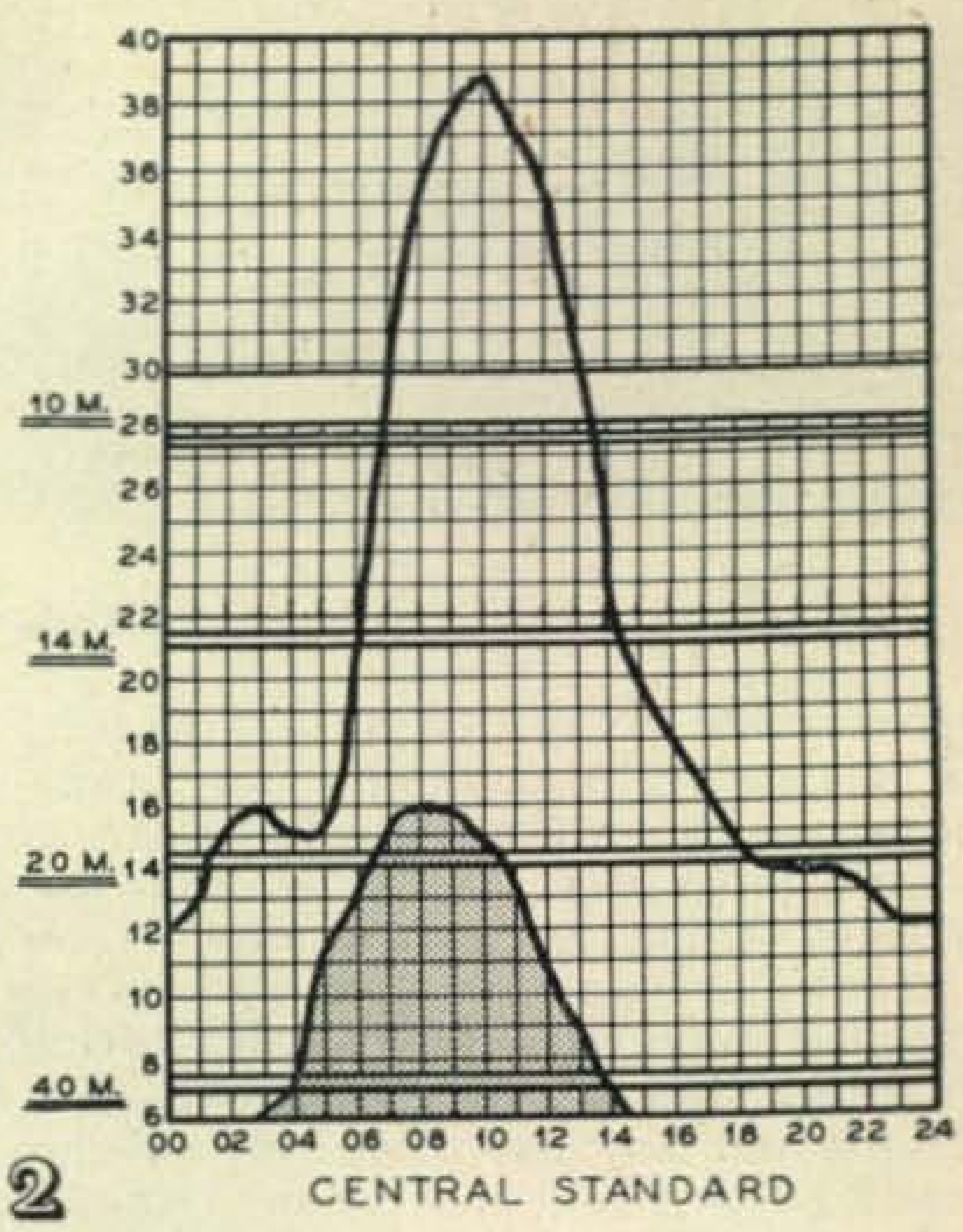
**Assistant Editor, CQ.*

Monthly DX Predictions

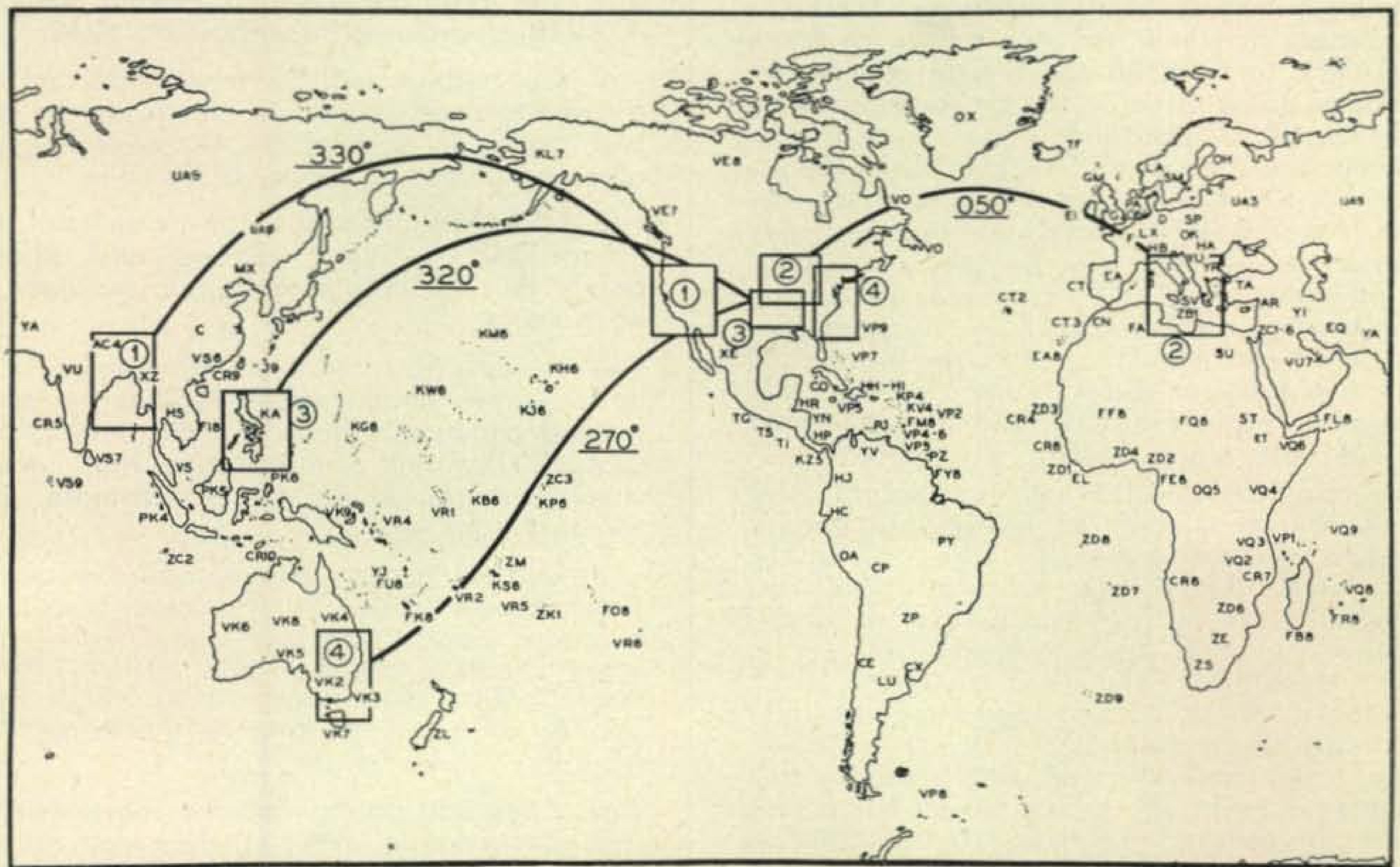


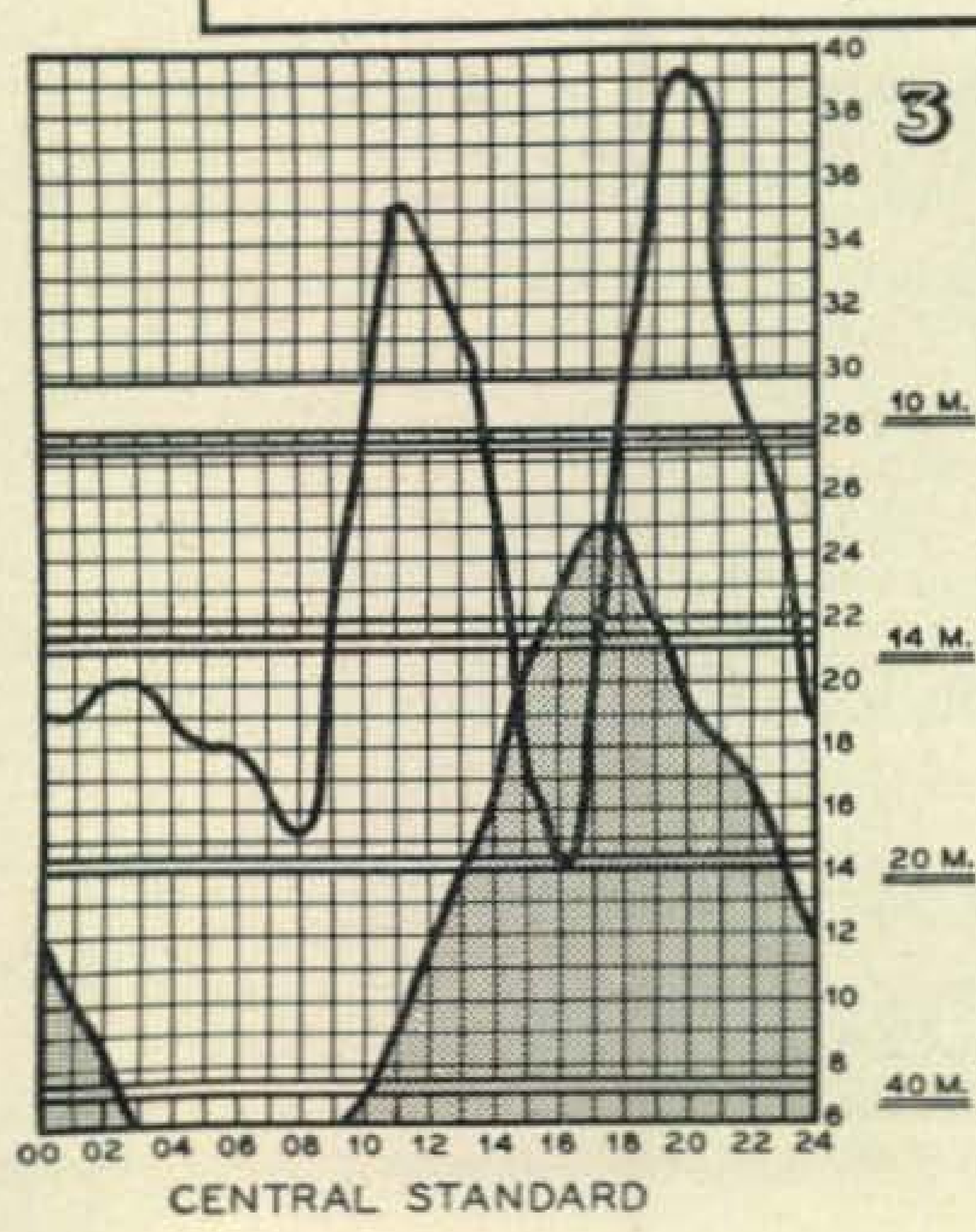
1

Maximum Usable Radio Frequencies—Charts show the maximum usable frequencies propagated by the F2-layer over the paths indicated in the world map. The abscissa shows the local standard time at the point of origin of the path. The ordinate shows the frequency in megacycles. Amateur frequencies fall within the two heavy parallel lines that indicate the upper and lower limits of the principal bands.



2





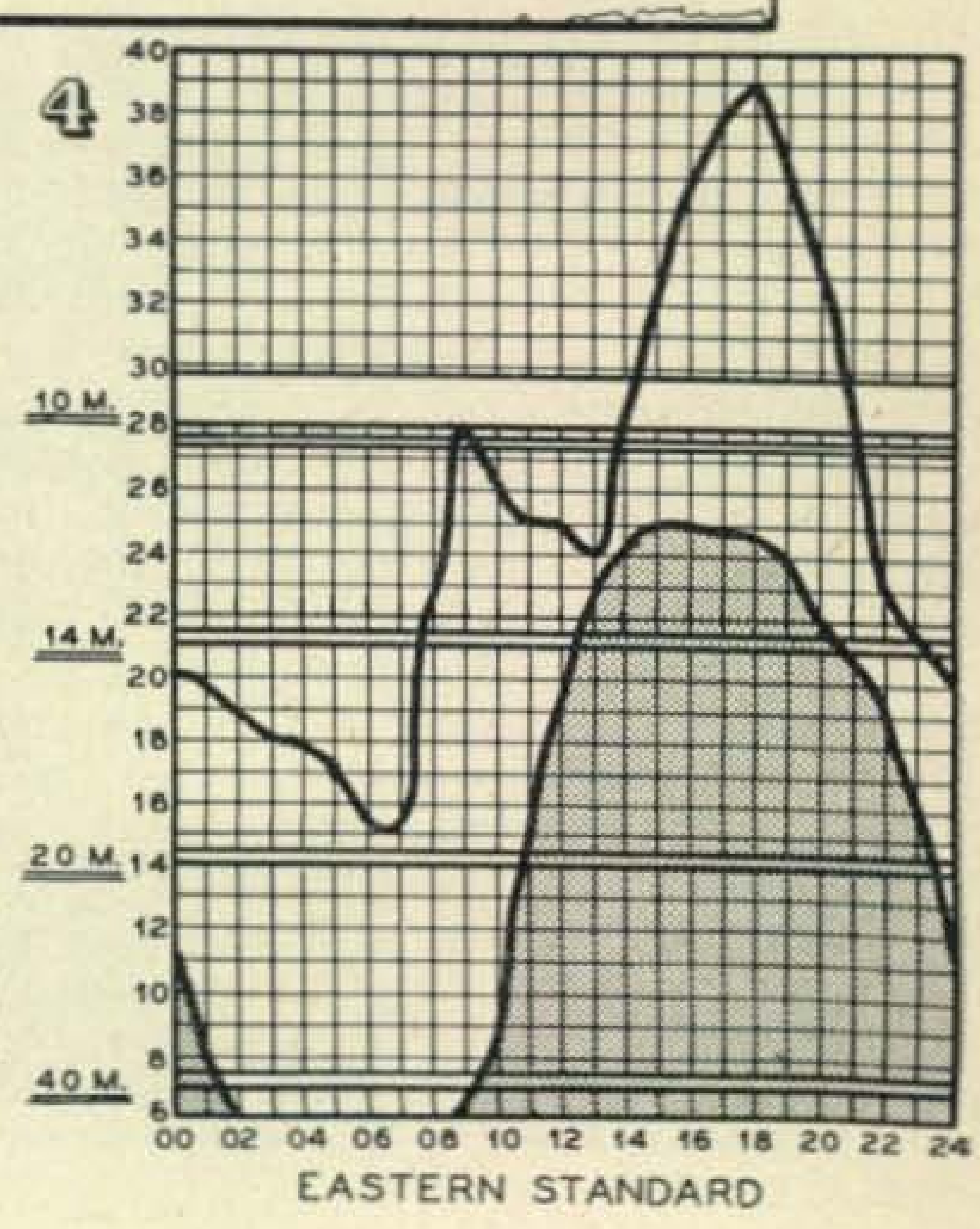
3

Lowest Usable Radio Frequencies—The shaded area in each chart indicates unusable radio frequencies for the illustrated path. The LUF is calculated for an above average amateur location using a good communications receiver. The effective radiated power is assumed to be 1000 watts. The LUF is based upon average monthly signal absorption and does not include the effects of abnormal or auroral zone absorption.

Azimuth—Radio transmission is known to vary considerably with geographic latitude and longitude. Each path MUF and LUF as illustrated is calculated for the "short-path". This is the path shown in the map.

Variations in Forecast—All graphs are monthly predicted average conditions. On ionospherically "quiet" days some variation amounting to less than 15% may be expected. However, a value representing 0.85 of the MUF will be exceeded over 90% of the total time. The graphs do not indicate radio propagation conditions during ionosphere storms or sudden ionosphere disturbances. They are not adjusted for the effects of sporadic-E layer formation or long and short scatter. Radio disturbances of the ionosphere storm type are the most severe for paths which pass through the auroral or polar regions, the effects gradually tapering off towards the equator.

4



Conducted by HERB BECKER, W6QD*

How many zones and countries have you worked in the DX Marathon? You mean, you haven't heard of the Marathon? In that case, I wonder what I have been preaching about for the past few months trying to cook up interest. In any event, there will be some of you reading this column for the first time, and if you want to know what the 1948 DX Marathon is all about, you will find the details not too far down the column. Just keep reading . . . you'll spot them. I think you will find this year-long contest very interesting. It is the type of contest in which you don't have to break your fool neck to work all the DX in one or two weeks. You're going to be on the air some, anyway, whether there is a Marathon or not, so you may as well keep record of your 1948 DX achievements and send us a log. Even those of you who are way up in the Honor Roll, in zones and countries, may as well make use of your time on the air, because, in spite of everything, and your high totals, you are going to do a certain amount of listening. So, summing it all up, this thing will run during the year 1948, and those of you who operate in the DX contest coming up in February and March should collect some pretty good totals to start with.

There is one little rule I would like to emphasize in the DX Marathon and that is the one relative to sending in your latest monthly additions for the Marathon totals. Only those contacts which we receive within sixty days of the date of *QSO* will be accredited to your totals. As you can see, in this way, the monthly Marathon totals as shown in this column will be current, and this will, likewise, eliminate the possibility of a few boys amassing large totals and then sending them at the end of the year with the thought of pulling a fast one on the contestants who have been submitting their totals each month. I believe you fellows would rather see the running totals and make it a fair contest for each and every one to observe on a month-to-month basis. The simplest way to make certain your Marathon totals are up to date is to make it a rule to send them on schedule, once each month, so they will arrive in my hands no later than the *fifteenth*.

About the time you read this, I hope we will have a batch of Zone and Country log forms for your convenience in compiling your list of zones and countries. This will not only assist you in making up the list, but when submitting it to our DX committee, it will help no end in the saving of time. These forms would be ideal to obtain, not only for your postwar zones and countries, but for the 1948 DX Marathon as well. When the list is sent in to us, we will use it as a Master List to which we will make the additions from one month to another.

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

1948 DX Marathon

CQ is sponsoring a DX Marathon for the year 1948. Many of the DX men feel that by the first of the year a DX Marathon will revive some of the interest that has been lost during the terrific last two years of DX. A simple set of rules governs the DX Marathon:

1. The 1948 DX Marathon begins January 1, 1948, and closes December 31, 1948.

2. Competition will be worldwide and on a zone-to-zone basis. In other words, the high station in each of the 40 zones will be given an award as winner of his zone.

3. Classifications will be the same as in the Honor Roll, i.e., "C.W.—Phone" and "Phone only", thus actually making two winners in each zone.

4. In order to receive credit, claims sent to us for zones and/or countries must be postmarked within sixty days from the date of the QSO. This will assure listing the current monthly scores in CQ and eliminate last minute entries.

5. Due to the tremendous amount of detail work, please list all DX Marathon scores on a separate page from Honor Roll scores and other DX news, and mark plainly "DX Marathon". This will greatly assist W6DI and W6SA, of our committee, in tabulating the Marathon scores for you.

6. Zone and country lists must be submitted in the same manner as though they were for the Honor Roll: the zones listed in numerical order showing the call letters, date, and time; the countries in alphabetical order by country, followed by the call, date, and time.

7. The CQ DX Zones of the world, and the official DX Country list, will be used for the yardstick.

The cooperation of all DX men in the states to help spread the word overseas is requested. We think that as the years progress, it will be interesting to see who the winners are from one year to another.

VE7ZM W.A.Z. No. 11

To Bill Wadsworth, VE7ZM, goes the honor of being the first Canadian station to achieve the W.A.Z. award. Not only is he the first VE to W.A.Z, but he is the first VE to work AC4YN. As if one W.A.Z. isn't enough, Bill asks, "Is there a bonu

W.A.Z. HONOR ROLL

C.W.-PHONE	Zones	Countries	C.W.-PHONE	Zones	Countries	C.W.-PHONE	Zones	Countries	C.W.-PHONE	Zones	Countries
W6VFR	**40**	**182**	G3AAK	39	122	W2CWE	36	125	W2GVZ	31	82
W8HGW	**40**	**181**	W6ANN	39	121	SV1RX	36	119	G5OQ	31	78
W2BXA	**40**	**176**	G5WM	39	120	W3ZN	36	119	W6IFW	31	77
W6PFD	**40**	**176**	G8RL	39	120	MD5AK	36	118	G6BB	31	74
W6MJB	**40**	**174**	G6BS	39	117	W9LNM	36	116	W8JM	31	71
W6ITA	**40**	**172**	G3QD	39	116	W2RGV	36	116	W5LVD	31	71
W6SA	**40**	**167**	W6OMC	39	114	G2CNN	36	114	KP6AB	31	70
W6ADP	**40**	**163**	W6YZU	39	114	G2AKQ	36	112	W4HXO	31	67
VE7ZM	**40**	**155**	G3TK	39	114	W2PUD	36	111	W6KMN	31	66
W6LEE	**40**	**150**	MD1D	39	110	W6RW	36	108	W6JFJ	31	63
ZS2X	**40**	**142**	W6QD	39	109	W9MZP	36	106	W8QUS	31	59
W6SAI	**40**	**135**	W7GXA	39	106	W9TB	36	101	G3ACC	30	83
G2PL	39	185	OK1AW	39	106	W2CNT	36	100	G2HFC	30	81
W2GWE	39	181	W7ETK	39	105	WØAZT	36	100	GM3AVA	30	80
G6ZO	39	180	W6UZX	39	104	G2AO	36	100	G5WC	30	77
W8RDZ	39	179	G6PJ	39	76	G6WX	36	95	G2VV	30	76
W3BES	39	176	W3JNN	38	164	GW4CX	36	92	G2WQ	30	76
W8BKP	39	170	W2PEO	38	159	W6PQT	36	90	WØLAW	30	67
W6ENV	39	169	W2CYS	38	144	W8VLK	36	88	G5HH	30	67
W2HHF	39	165	W3GHD	38	142	W8HSW	36	85	W1KQH	30	65
W5ASG	39	164	W9RBI	38	142	W9FKH	36	85	D4AVC	30	64
W4CYU	39	162	W8NBK	38	142	W4MZ	36	82	W9WEN	30	62
W9ANT	39	160	W2HZY	38	140	GM2AAT	36	75	W8PCS	30	61
G5DQ	39	160	W3EPV	38	140	W6LN	36	72	**PHONE**		
WØYXO	39	157	W2IOP	38	137	W2DYR	35	110	W6DI	38	132
W6DI	39	157	W3EVW	38	137	W8REU	35	104	W1HKK	37	127
G8KP	39	156	W8FJN	38	134	G8VR	35	100	G6LX	37	124
G6QB	39	152	W4BRB	38	133	VE3AAZ	35	99	G2AJ	37	121
G5YV	39	151	W1NMP	38	133	W6YYW	35	92	G3DO	37	114
G2AJ	39	151	W3JTC	38	132	G2AVP	35	89	W8BKP	37	113
W6SN	39	150	G8IL	38	131	W6DLY	35	89	G3DO	37	110
W2COK	39	150	W3IYE	38	130	W9FNR	35	85	G2PL	36	128
W6KRI	39	150	G6LX	38	126	G8RC	35	78	W1JCX	36	126
W7FZA	39	150	W8CVU	38	125	G3BDQ	35	74	G6BW	36	119
WØNUC	39	150	W2RDK	38	124	CM2SW	34	132	W2BXA	36	117
G2WW	39	147	GW3AX	38	123	G8QX	34	99	G5YV	36	106
W6FHE	39	147	WØSQO	38	123	G8KU	34	96	G6WX	36	105
W7BD	39	147	G5CI	38	115	W9WCE	34	96	W3DHM	36	96
D2KW	39	147	W5CPI	38	113	VK4RC	34	91	W7HTB	36	94
W8LEC	39	146	G3ZI	38	107	W3JKO	34	91	W2DYR	35	122
W6TT	39	145	G8IP	38	105	G6XX	34	89	G3FJ	35	115
W6EBG	39	144	W6LEV	38	79	W4DIA	34	86	W1NWO	35	112
W6WKU	39	143	G3BI	38	75	W6LRU	34	84	W8BF	35	108
W9IU	39	143	W1BIH	37	130	W2JA	34	84	GM2UU	35	107
G3DO	39	142	W6AM	37	130	W6MI	34	84	W1MCW	35	105
W9DUY	39	141	PY1DH	37	128	W7BTH	34	83	W6PXH	35	104
WØNTA	39	140	W4OM	37	126	D4AVE	34	81	G8QX	35	100
G6BQ	39	140	KP4KD	37	124	D4ANM	34	77	W9HB	35	89
G3FJ	39	139	W1KFV	37	121	J4AAK	34	66	W6SA	35	78
WØGKS	39	139	G4CP	37	117	W6BIL	34	63	W3JNN	34	103
ON4JW	39	136	W3KDP	37	115	W7FNK	34	54	W9RBI	34	99
W6ZCY	39	135	W1JYH	37	114	W2ZW	33	115	W8BIQ	34	93
W6RDR	39	134	W2TJF	37	113	W4QN	33	94	W6PCK	34	91
W6LER	39	134	W4FPK	37	110	W6ZZ	33	91	W5ASG	33	98
W6BPD	39	134	W4ML	37	110	W3AYS	33	88	W2ZW	33	113
G5RV	39	132	W2PQJ	37	110	G2LC	33	85	W2PQJ	33	90
G2VD	39	132	WØOUH	37	110	W2GUR	33	82	W2DRH	33	60
G2CDI	39	132	G4AR	37	108	W5BK	33	79	XE1AC	32	100
W6CEM	39	131	VE1EA	37	107	GM2UU	33	79	W2HY	32	81
W6BAM	39	130	W9VND	37	106	G8VG	33	78	WØHX	32	80
G2FSR	39	130	W9YNB	37	102	G3BFC	33	77	G6BW	32	69
CE3AG	39	128	G5MR	37	100	W9EMW	33	74	W2NXZ	32	57
VE7HC	39	128	W2BLS	37	100	W7EYS	33	68	W4HA	31	78
W9NRB	39	126	VK2ACX	37	99	W2WC	33	65	W5LWV	31	75
G5BJ	39	126	G3AAE	37	99	W6WUD	33	61	W9GZK	31	66
G3AAM	39	126	W8WWU	37	99	W4HA	32	88	W9WCE	30	78
W6TI	39	125	W2SGK	37	95	W2HY	32	77	WØSQO	30	74
G5VU	39	124	W6AX	37	87	G3AGN	32	74	W5ALA	30	72
W6EAK	39	123	W6EPZ	37	86	G3VA	31	101			

for having worked and confirmed more than one W.A.Z? Ha! I have four complete confirmed W.A.Z.s postwar here." Welcome, Bill, to the W.A.Z. gang, and congratulations on your achievement. VE7ZM shows up in the Honor Roll with 40Z and 155C.

W6ADP W.A.Z. No. 12

Glenn Means, W6ADP, one of the oldtime DX fanatics, got over his case of QSL card jitters when he received a card from C8YR. At the present time, W6ADP runs a kw. into a pair of 250THs, the antenna being a 2-section 8JK. He is now building a 3-element rotary, but I don't know what for unless it is for the 41st zone. The receiver is an HRO. The Honor Roll, this month, tabs W6ADP at 40Z and 163C. Our congratulations to Glenn on his fine work.

VR5PL wants it known that he is making special arrangements for the A.R.R.L. DX contest. Noel and Bert, VR5IP, will be on day and night on 7100 and 14,000 kc,

Now let's see what we can put together in the way of DX chatter. Well, here's something. W2-IOP has . . . oh, skip it . . . it's nothing. But, a lot of the boys have been reporting *VQ1HJP*. Of course he is *VQ3HJP* who hopped over to Zanzibar for a few days, giving the boys this nice new coun-

(*Continued on page 82*)

Conducted by VINCE DAWSON, JR., WØZJB*

DESPITE THE DECEMBER lull compared to November enough has happened to keep the gang on their toes and transcontinental U. S. openings are continuing at the present writing.

European openings occured on Dec. 1 and Dec. 18, from G5BY to W1-2-8. The last transcon reported was from W7ERA to W2-3-4 on Dec. 21. W7ACS/KH6 broke into W6 on Nov. 29, and on Dec. 14 worked W6-7, hearing W5ELL in New Mexico. The first W7 contacts were with W7ERA and W7FFE in Oregon.

From this mass of 6-meter DX, we find that the leading DX operator is W5VY, ex-W5EHM, Pat Paterson of San Antonio. Texas, with no less than 10 countries worked two-way on 6 meters! Pat will be remembered as W5EHM, who kept plugging 5 meters as early as 1935 for signs of Es DX. His list is most impressive and includes 40 states, KH6-LU9-XE1-OA4-PAØ-G2-G5-G6-F8-HB8-HB9-VE3, 4, 7, and all U. S. call areas. Our hat is off to you, Pat, and I'm sure the rest of the v-h-f gang around the world join us in saying the same.

W8ZVY, Xenia, Ohio, is second with 7 countries worked: OA4-LU9-KL7-PAØ-G2-G5-G6-VE1, and WACA.

An ardent v-h-f man who since October has spent 10 hours a day on 50 mc is G5BY, Hilton L. O'Heffernan of South Devon, England. Hilton has made many a W happy by answering his call on 50 mc and has the amazing record of 175 contacts with 98 stations; 167 of these with 94 stations in the U. S. A. and Canada, all two-way on 50 mc from Nov. 6 to Dec. 22. Hilton says, "Apart from the technical aspect of all this, one of the most interesting results has been the actual contacts between v-h-f enthusiasts on both sides of the Atlantic. Known only to each other through the medium of the v-h-f columns of various publications—and by chance an occasional contact on the lower frequency bands. It was the thrill of a lifetime to be able to meet and talk on their own happy hunting ground of 50 mc. Calls and names—made familiar by their Honor Roll positions and record of monthly achievements—suddenly assumed a real personality and the thrill of those crowded four weeks in November will go down in G5BY's memory as one of the outstanding and never-to-be-forgotten events in 22 years of active participation in this great game of ours—amateur radio.

The transmitter at G5BY is a pair of 35TGs, modulated by a pair of TZ-40s, feeding into a rhombic beamed on California, 420′ on a leg. The receiver is a special home-built converter, with 2 r-f stages. no lead over 1/2″, into a 1.5-mc i-f strip.

In KH6 land, W7ACS/KH6 is a "lone" representative on 50 mc and has kept an eagle eye for signs of DX. Gene says, "In spite of the high MUF that has been recorded around these parts, I have been there and only found conditions good on Oct.12, Nov. 29 and Dec. 14, for two-way 50-mc contacts to W5-6-7. It's funny how some days the band sounds like it should to be hotter than a Chinese five-cent firecracker and nothing comes through and the next day it sounds exactly the same—yet they do come in."

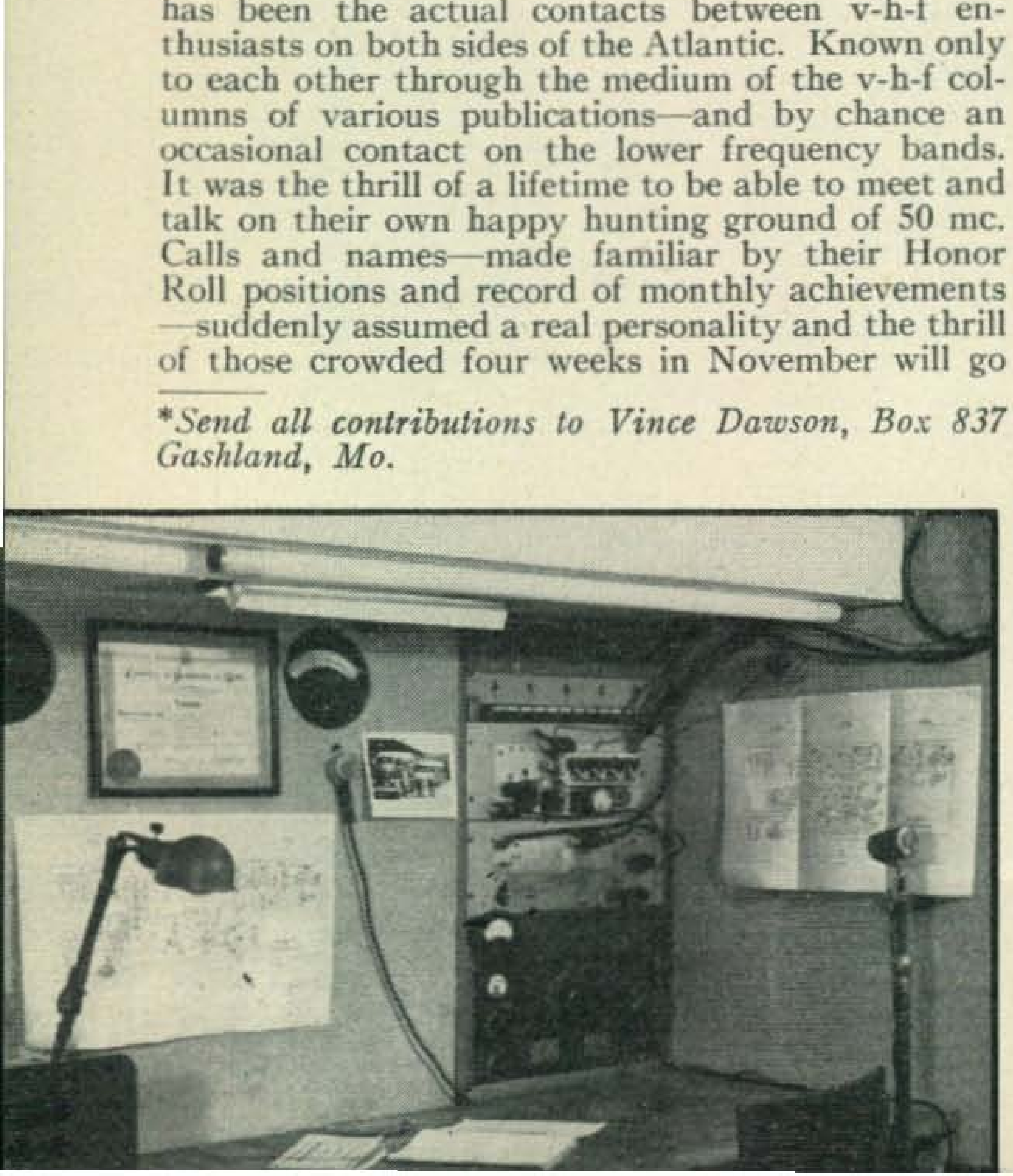
Nothing has been heard from W5BSY/MM and WØTKX/MM, but a new one, W7FS/MM aboard the NATHANIEL CROSBY, now comes to light. During the height of the Atlantic openings, Keith Olson, W7FS/MM, had the great fortune of making the crossing from Europe to Newport News, Va., and sends us his list of stations heard on 50 mc and worked 28 mc cross-band.

Nov. 16 while 1800 miles east of Boston near the Azores he worked WØJVE-WØKYF in the St. Louis area and heard W9ZII (?), W9ZHY, W5JLY and WØZJB, between 1018-1148 EST. Nov. 19; position 1500 miles east of N. Y. C., from 0800-0820 Keith heard PAØUN, G6XM. At 0830 EST the band swung south for French and N. African harmonics until 1048 EST, no amateur signals heard. At 1230 EST the band again opened for 15 mins, with harmonics in the 50-54 mc region. Nov. 21, 1200 miles east of N.Y. PAØUN worked cross-band at 0758 EST, then heard G5BY, MQ, G6XM, DH, OS, until 0910 EST. At 1000 EST weak radar was heard on 51.1 mc. Nov. 22, 800 mi. east of N. Y. British radar on 51 mc heard at 0726 EST. At 0736 G5BY, G2JU, G5MA, PAØUN, HB8VK, OK1X (51 mc), PAØPAX and F8EFR were heard to 1110 EST, with good band conditions. Nov. 23, 450 mi. east of N. Y. C., starting at 0845 EST Keith heard G5BM, PAØUN (heavy echoes), HB8VK until 0927 EST. At 1200 EST the band opened west to hear VE7AEZ, W6KEV, W6OVK, W7FP, W7ERA, W7HEA, W7BQX, W7FFE, W7EVO, W7FDJ, W6UXN, W7DF, W7BOC, W7JPA, W7DYD, W7CX, (Nevada), W7DMN, W7FIV and last out at 1526 EST was W7BQX. All W7s were S9 while the W6s had heavy QSB.

Keith, W7FS/MM, says that numerous other calls were missed because of "cute" methods of signing, so take a hint fellers, even if in a local contact, use standard phonetics when signing your

(*Continued on page 66*)

Send all contributions to Vince Dawson, Box 837 Gashland, Mo.



Canadian 6-Meter DXer, VE3ADO, Toronto

(Number five of a series)

SSSC

Now we know why the venom of the radio bug is so difficult to purge from the human anatomy: It never grows stale! Just when it seems that we have done about everything that can be done in the way of smoothing out the wrinkles in radio communication, some ham pops up with a new idea or perhaps a modern application of one buried so deep in the cobwebs that it has been lost to view.

This time it's Single Sideband Suppressed Carrier radio telephony. You probably have read of the interesting work done by "Mike" Villard, W6YX, and "Art" Nelson, WØTQK. These two fellows have dusted off a method of radio telephony put aside many years ago as too complicated for amateur use, and demonstrated that it holds tremendous promise of being a big step toward a solution of today's QRM problem in the amateur phone bands.

Reduction of QRM is not the only advantage SSSC has to offer the amateur. It actually brings into view the end of soap box oratory in the phone bands, the reams of notes and comments to be remembered for reply, and the ear-splitting whine of two or more carriers beating together. SSSC holds promise that the time is not too far off when we will no longer spend time talking to ourselves because our signal is buried and the other fellow can't tell us about it, for with SSSC duplex operation is a reality, legally, too, because no carrier is transmitted. SSSC has another gift for the amateur, this one really close to his heart: More effective speech power can be handled by a tube of given rating. With no carrier to worry about, power handling capabilities of the final amplifier can be devoted exclusively to the sideband frequencies which carry the intelligence.

We are going to look into this business of SSSC.

Seth Card, W1DRO

National

ADVERTISEMENT

The YL's Frequency

Conducted by LOUISA DRESSER, W1OOH/2*

WE THINK THIS NOTE from E. H. Cunningham, W5CU, should be titled, "How to make the world a better place to live in," or, "Saving the peace by practicing democracy" . . .

He writes: "Just a line to let you know one more XYL is on the air; my XYL, Velma Claire, received her Class B ticket today. We constitute quite a family of hams. I am W5CU; my XYL is now W5-NWR; my wife's son, A. P. Sanders of Laredo, is W5NET, and his wife is W5NES.

We've always heard that everything in Texas is bigger, or better, or there's more of it—Well . . .?

But W5NWR isn't the only new YL call we'll be hearing on the air. During recent weeks quite a few YLs have been taking the fateful trip to the R I, and among the lucky ones are: WØAGI, Gwynn; W6BDM, Kay; W6AVE, Thelma; W5-KQG, Frances; W6AWW, Eleanor; W5KNV, Ina Mae; W2WLC, Mary Jane; W1QON, Eleanor; W5-NOW, Grace; W4MQQ, Margaret; W9PRO, Elizabeth; W2WFG, Hilda; W7LNV, Ella W5NNP, Margareto; W5NNN, Dorothy, and WØDXF, Mary.

YL DX

It's been a long time since the YLs have had a special corner in these pages for comparing their DX. Many of the gals keep right up with the OMs in fishing up DX, and one of them is Helen, W2-NFR, who has made W.A.C. and worked 106 countries and 37 zones, all on 20-meter c.w. Some of her best include: CR6AI, MB9AI, UD6BM, UG6-AB, and PKI through 6.

Two other W2s chasing DX are Jerry, W2PBI, with 41 countries and Willy, W2MEG, with 21, both on 10-meter phone.

Jimmy, W5LVT, says: "It has been thrilling to work DX on 10. My total is 22 countries, but I have really just started working. The hardest to get on phone were D4ARN, I1GA, VP6HR, LX-1BO, LX1BG, D4AOM, and ON4VK."

Avis, W8WUT, is another 10-meter phone gal. She has made W.A.C. and worked 34 countries, postwar, some of her choice contacts being VU2-CQ, J2AAT, J2FOX, J9AAI, W1LTQ/TF, KG6-AW/VK9, ZB2A, and EL2A.

Lou, W1MCW, is a real DX "hound" with 118 countries and 35 zones worked on 10 phone. Some of the most difficult to work from her location were: AC3SS, G5KW/KUWEIT, VS7PW, CR9AG, XU-6GRL, UA1AB and PK1AW.

Another W1 DX chaser is Dot, W1FTJ, but she prefers to do her hunting on c.w., chalking up to date 77 countries and W.A.C.

Esther, W9EFW, prefers DX above all else and works her share on 10 phone. She runs 250 watts to a pair of 812s and has a 4-element rotary with a huge spotlight on it. The latter she explains by saying: "You, see, before the war I had the misfortune of burning up two motors by not being able to see that the antenna was still rotating, due to the sleepy condition that I would be in trying to work just a little bit more, Hi! So the OM, W9-GOX, decided—no more of that. Now when I leave the rig the first thing that stares me in the face is that nice red light." Some of the DX Esther has worked in recent months includes: OA4BI, HK3-AO, FA8JD, OQ5AB, TG9FG, ZS1AV, CE1AO.

Joanna, WØJWJ, writes: "I seem to be the only YL DXer in the Ø district. Have worked about 40 countries to date."

Upholding the 7th district, we hear from Lizette, W7HDS, that she has worked 30 countries on 10 and 20 phone. She adds: "I have never really gone in for DX—just worked enough to keep ahead of the OM." (Editor—!!!)

From the land of DX and the kilowatts we hear from Maxine, W6UHA, that her score is 94 countries and 32 zones postwar on 10 phone and 20 c.w., which she says she enjoys just as much as phone. Best DX to date: VS9AB (on 10 phone), ZB1AC, ZB2A, CR9AG, UA3AG/Ø, CR7AL, OQ5BL, VS4JH, VS1BX, ZS3D, OK1LM, and OIX7.

Another YL who likes c.w. is Enid, W6UXF, who works all her DX on 40 and 20. Says she: "Just got my W.A.C. and now I'm gunning for WAZ. Best on 20—G6CJ and UA1DS; on 40—CR9AG, ZM6AC, ZS6DW and VR5PL. I hope to give the boys a run for their money in the next DX contest, with my e.c.o. pushing a cool kw!"

High scorer is Naomi, W6YZU, with 114 coun-

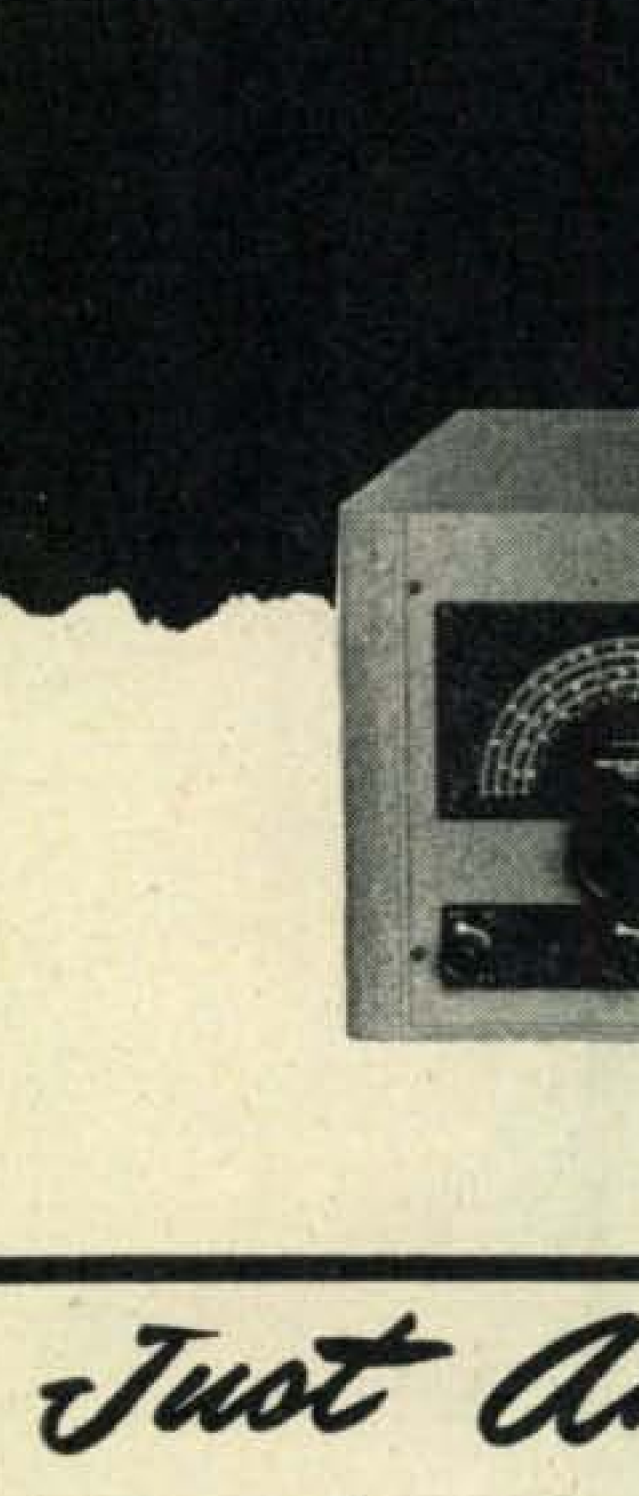
(*Continued on page 58*)

**Assistant Editor, CQ. Send all contributions c/o CQ, 342 Madison Ave., New York 17, N. Y.*

Greta Pettersson, SM3IL, with her family—Birgit, aged 7; Briff-Marie, aged 4; and her OM, SM3IK, who is a sea pilot.

matched in appearance...
Unmatched in performance!

Just Announced!



The "Boomerang" (MB-3)

The new "BOOMERANG" is a break-in device, a signal monitor, a code practice unit, and a tone modulator for MCW. It will follow the fastest bug. Self-contained power supply. All you need is a receiver with a headphone jack. Improves your QSOs 100%.

The HF 10-20 Converter

It provides outstanding and imageless reception on 10, 11, 15 and 20 meters. Output (i.f. frequency) is 7 mc. Features include provision for separate antennae, band selector switch, self-contained power supply, planetary tuning and high gain. If your receiver tunes only to 18 mc, the HF 10-20 is necessary for reception on 10, 11 and 15 meters, and will provide improved reception on 20 meters.

Canadian Representative:
Measurement Engineering, Ltd.
Anprior, Canada.

From two meters to reception through the broadcast band, RME receiving equipment still provides the optimum in performance.

The new DB-22 Preselector, with self-contained power supply, has an over-all gain of 30 db throughout its tuning range of .54 to 44 mc. The image ratio is 50 db down with a communications receiver such as the RME-45.

The RME-45 is a piece of equipment that stays modern. It's now available with the new NBF-4 ratio detector for narrow band FM. The NBF-4 can also be used with all previous models of RME-45s.

The VHF-152 Converter was quick to set many new DX records on 144 to 148 mc. Performance is also outstanding on 6 and 10 and 11 meters. It has generous bandspread, high gain, imageless reception and self-contained power supply.

Illustrated folders on request.

TIME WILL TELL

RME — FINE COMMUNICATIONS EQUIPMENT
RADIO MFG. ENGINEERS, INC.
Peoria 6, Illinois U. S. A.

PARTS AND PRODUCTS REVIEW

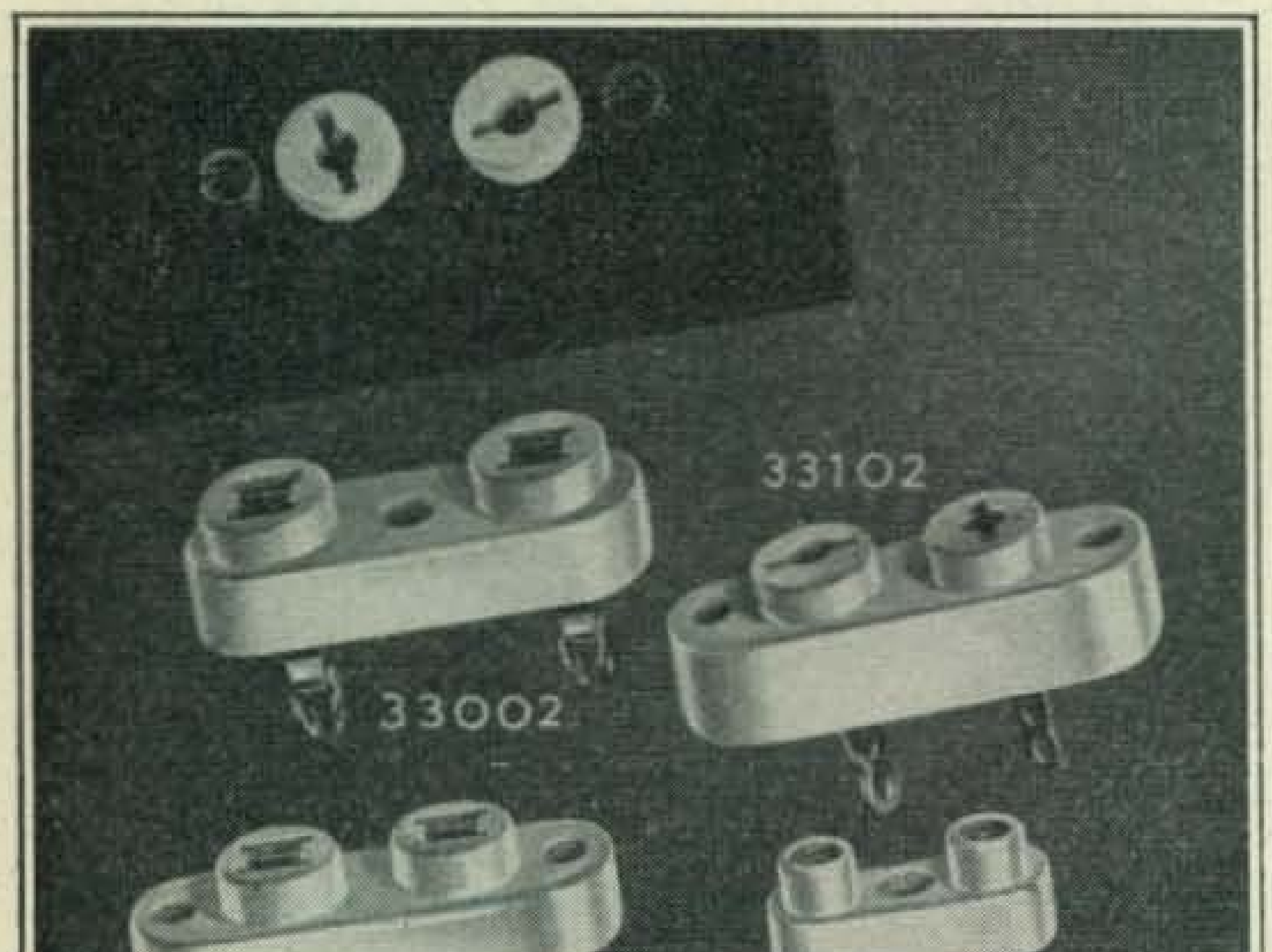
Phenolic Molded Tubular Capacitors

Sprague Electric Company, North Adams, Mass., has announced a complete line of phenolic-molded paper tubular capacitors. Features of the new units include the facts that they are highly heat- and moisture-resistant, are non-inflamamble, are rated for operation from —40° C. to + 85° C., and are mechanically rugged.

In most instances, the new molded tubulars are smaller and, in no instance, are they larger than ordinary Sprague paper tubular capacitors of equal rating. Their unique phenolic sealed construction assures maximum dependability even under extremes of heat, humidity, and physical stress, thus giving them far-reaching advantages for a long list of products ranging from home or auto radios and electrical appliances to military equipment. Available types include all popular capacities in 200, 400, 600, 1000 and 1600 volt types. Sprague Engineering Bulletin 210 containing complete details on the new development is available from the manufacturer.

Crystal Holder Socket

A midget crystal holder socket, developed specifically for use with the midget hermetically sealed CR7 crystal, has been announced by the James

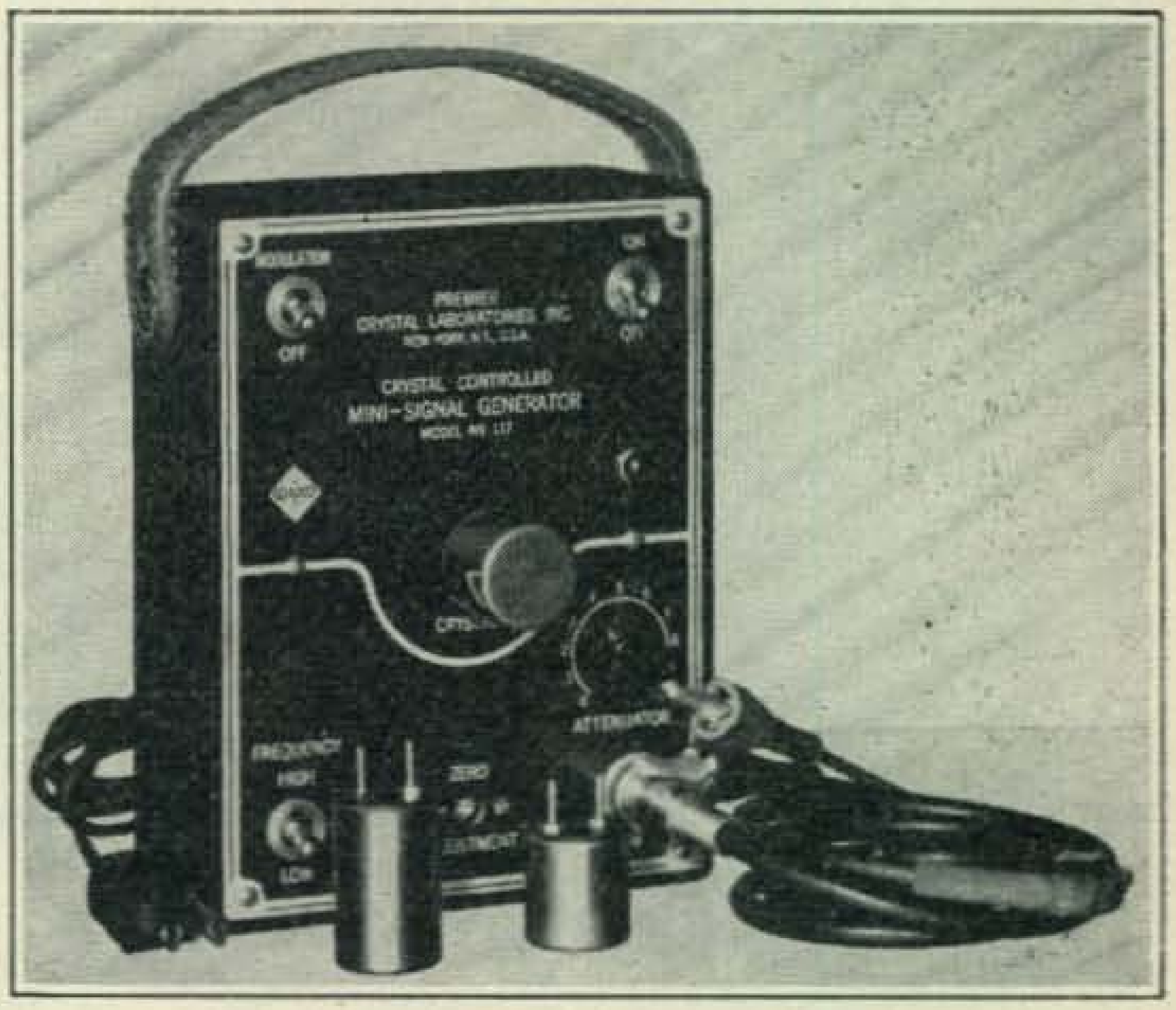


Millen Co., Malden, Mass. This socket, No. 33302, is made of steatite with contacts of silver plated phosphor bronze. Pin spacing, center to center, is .5, pin diameter is .05.

Crystal-Controlled Signal Generator

Crystal-controlled precision is combined with extreme portability in Model No. 117 Mini-Signal generator developed by Premier Crystal Labs., Inc., 57-67 Park Row, New York 7, N. Y. With this device and the appropriate crystal, any frequency from 100 kc to 10.8 mc, with harmonic operation for higher frequencies, can be obtained using any 110-volt power supply, a.c. or d.c.

The generator produces an r-f signal modulated by an audio frequency of approximately 400 cycles, under the control of a continuously variable attenuator and an off-on switch. It uses Premier PL-100



wire-mounted crystals made to ± .05% precision. The instrument draws 17 watts, weighs 3¼ pounds, measures 3 x 5 x 7 inches, and comes equipped with a 6-foot cord and 53-inch leads with insulated clips.

New Literature

P. R. Mallory & Co., Inc., is now distributing the first "Vibrator Data Book" published. This new work discusses fully a wide range of design and application problems for vibrators and vibrator power supply in its 135 pages of text illustrated with 64 charts and diagrams. The Mallory "Vibrator Data Book" contains exhaustive descriptions of basic structures, designs and Vibrator characteristics. It discusses fully the selection of correct types for specific problems; outlines the latest information on applications; describes and illustrates the circuits involved and covers in detail the modern inspection procedures. The text is complete and easy to understand and is amplified with 16 pages of pertinent Tables, Charts, Graphs and Formulas. Loose-leaf Vibrator Characteristic Data Sheets are included with all copies of the Data Book ordered by manufacturer's engineers. These sheets are supplied to Radio Service Men only on special request. The Data Book is available through all Mallory distributors or direct from P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind., at $1.

Terminal Block Kit

A terminal block kit, designed expressly for experimental work and maintenance operations, has been introduced by the Curtis Development & Mfg. Co. With this kit, termed "Type B," any number of terminals from 1 to 14 which are similar

(*Continued on page 82*)

MERIT

CTC

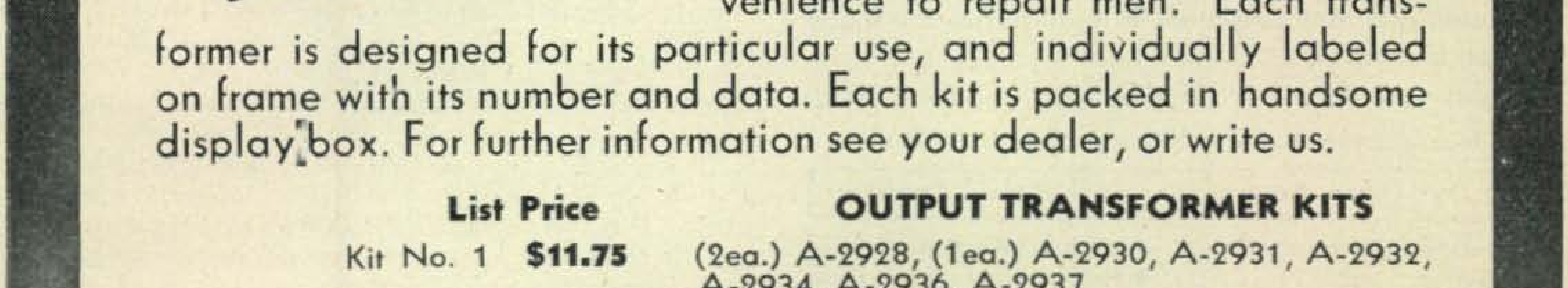
Since 1924

FINE RADIO PARTS

New! MERIT HELP FOR REPAIR MEN

Compact Replacement Kit containing 8 MERIT Quality Transformers for wide range of requirements. The MERIT Kit takes the place of so-called "universal replacement transformers", and brings much greater convenience to repair men. Each transformer is designed for its particular use, and individually labeled on frame with its number and data. Each kit is packed in handsome display box. For further information see your dealer, or write us.

	List Price	OUTPUT TRANSFORMER KITS
Kit No. 1	**$11.75**	(2ea.) A-2928, (1ea.) A-2930, A-2931, A-2932, A-2934, A-2936, A-2937
Kit No. 2	**12.20**	(2ea.) A-2928, A-2937, (1ea.) A-2930, A-2931, A-2934, A-2936
Kit No. 3	**11.80**	(1ea.) A-2928, A-2930, A-2931, A-2932, A-2933, A-2934, A-2937, A-2938
Kit No. 4	**12.90**	(2ea.) A-2928, A-2931, A-2936, A-2937



MERIT COIL & TRANSFORMER CORP.

4427 North Clark St. TELEPHONE Long Beach 6311 CHICAGO 40, ILL.

YL's FREQUENCY

(*from page 54*)

tries and 39 zones worked. And the date on her ham ticket reads Feb. 21, 1947! Working on 7, 14 and 28 with 800 watts to p.p. 450THs, Naomi has worked, among others: AC4YN, C8YR, EQ2L, ET1IR, TF-3EA, MD1D, MD5KW, SU1HR, GC4LI, VS7IT, YU7KX and VQ5JTW.

Ethel, W6PVV, on counting 'em up, finds she has 35 countries, all worked in the last year on 10 phone, including: FA8DX, ON4MS, OZ7EU, F8-MX, EI3J, PAØXZ, YV1AV, I1RM and KP6AA. "And I'm not forgetting VR6AA—I concentrated on that station for almost a month, knowing his operating like a book before I was the lucky one!"

Clara, W6TDL, another W6 on 10-meter phone, says she feels that she can't qualify as a DX "hound" but admits, "If I'm tuning and hear it coming in, I can get as big a thrill out of working it as anyone. I have worked over 50 countries and, of course, W.A.C. A short list of my best DX includes: CR-9AG, W2EJV/PK3, VS1CA, J8ACS, VR2AC, and ZS5Q, the long way 'round at 9:13 p.m. PST."

We know this isn't nearly a complete list of YL DXers, so let's have some more reports.

Club News

The pix of the N.Y.C. YL Club officers was published just in time (Jan. *CQ*. p. 54). The club now has new officers taking over for the 1948 season. At elections held at the December meeting, Helen, W2NFR, was elected president, and Rose, W2TU, vice president. Lillian, W2PMA, and Helen Zuparn were both re-elected as secretary and treasurer, respectively.

The Los Angeles YL club, according to President Clara, W6TDL, turned their December meeting into a house-warming party and canned food shower for Carol, W6WSV. They took the labels off the cans and substituted their calls or QSL cards. Carol exclaims: "The cans are truly mystifying—the only thing I can do for breakfast tomorrow is open up a can of W6WQK, add a can of W6YRL, and possibly mix with a can of W6YZU. Then for lunch, I can open a can of W6NZP, and hope it goes well with a can of W6VWR and garnish with a glass of W6NAZ. If I still feel hungry, I have a can of W6AAL and a can of W6TDL, and a large can of W6UHA to nibble on! Hope these gals all taste good in their cans. Hi!"

At this L. A. get-together a contest was held to name correctly 13 countries in South America on a blank outline map of the continent. W6TDL and W6UHA were tie winners, naming 11 out of the 13 countries. (DX sure does help geographical knowledge!)

YLs Overseas

Concentrating as we have on DX this month, here is a good YL DX contact for anyone who can work her—SM3IL, Greta Pettersson, of Härnösand, Sweden.

Greta's husband is SM3IK. It was not through him, howev er, that she became licensed. "I had just returned to my home town after some years in Stockholm and a year in England," explains Greta, "when I met our friend SM3LX, the manager of our third district, who told me, 'I have found just the hobby for you. Come with me tonight to a code class.' After 46 lessons I got my license. That was

(*Continued on page 82*)

It's Front-page News!

MICAMOLD XTR-1

45 WATT - 3 BAND CW TRANSMITTER KIT

Only **$34.** less tubes, crystal and key

Micamold fires the opening shot in the war on high prices with a low priced, high quality transmitter kit *priced within easy reach of every amateur.* Very simple to assemble. Complete from power supply to antenna matching network. Just plug in the tubes, crystal and key and you're on the air.

Operates on 80, 40 and 20 meters

Quality Engineered and Equipped Throughout

BAND SWITCHING . . . No coils to plug in. A flip of the switch puts you on 3.5, 7 or 14 MC band using suitable crystal.

SUREFIRE CIRCUIT . . . Crystal ECO (6AG7) driving final amplifier. No neutralization is required. Crystal current is less than one milliampere. Band switch controls both a tapped broad tuned oscillator plate coil and the final output circuit. Pi-network matches any antenna. Puts out a clean cut signal, no chirps.

ABSOLUTE SAFETY . . . No exposed live parts. When used with insulated lead-in wire it is impossible to get a shock during adjustment or operation.

SOUNDLY ENGINEERED . . . Designed to last and fully guaranteed! Every Micamold XTR-1 kit contains Grade A components including Micamold Capacitors, and is sold under the provisions of the standard warranty of the Radio Manufacturers Association. Simple, clear instructions for assembly, wiring and operation.

If your dealer does not have a kit on hand write to us for the name of the nearest dealer or send your order direct to Micamold with your remittance. Your kit will be shipped promptly.

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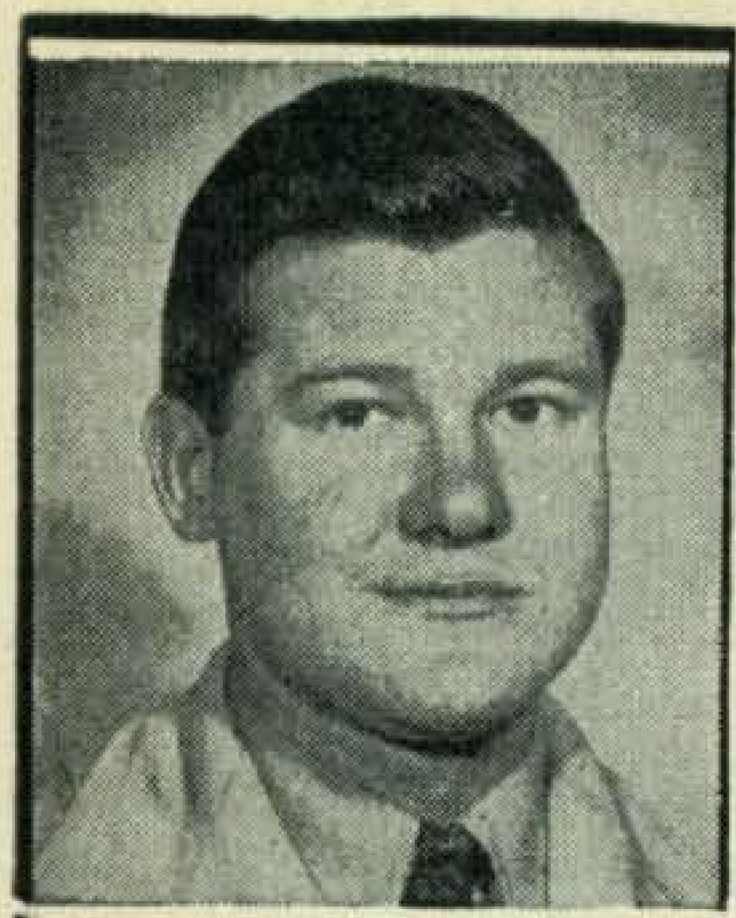
Manufacturers of High Quality Electrolytic, Paper, Mica Capacitors and Resistors

1087 FLUSHING AVENUE, BROOKLYN 6, N. Y.

50-MC DX HONOR ROLL

Calls	States	Districts	Others
W6UXN	46	10	VE1, 2, 3, 6, 7-KH6
W4GJO	45	10	VE1,2,3-OA4
WØZJB	45	10	VE2, 3, 4, 7-G5
WØUSI	45	10	VE2, 3, 7
W6WNN	45	10	VE1, 7
W9DWU	45	10	
W9ZHL	45	10	VE1, 2, 3, 4, 7-XE1-KL-G5-HB8-G6,5-KL7
WØDZM	43	10	VE1, 2, 3, 7
WØQIN	43	10	VE1, 2, 3, 7
W7BQX	43	10	VE1, 3, 4, 7
W7ERA	43	10	VE1, 7
W7FFE	43	10	VE1, 7
W9ZHB	42	10	VE3, 4, 7-G5-HB8-KL7
WØBJV	42	10	VE2, 3, 7
W1CLS	42	10	VE1,3-G5-G6-PAØ
W3CIR/1	41	10	VE1
WØINI	41	10	VE2, 3, 4
W5VY	40	10	VE3, 4,7-KH6-LU9-XE1 - OA4-PAØ - G2, 5, 6,-F8-HB8, 9
W2AMJ	38	10	VE1, 3, 7-G2, 4, 5, 6-F8-PAØ-HB8
W1LLL	40	10	VE1-G5 - G6 - PAØ
W8NSS	40	10	VE1, 4-VP7
WØSV	40	10	VE7
W4GIY	40	10	VE1
WØYSJ	39	10	VE2, 3, 7
W6AVV	39	10	VE1, 7-KH6
W7HEA	39	10	VE1-7
W8ZVY	38	10	VE1 - OA4 - LU9 - KL7 - PAØ,G2,5,6
W5JLY	38	10	VE7 - XE7 - VP7 - OA4 - G5, 6 - PAØ HP8
W5AJG	38	10	VE3 - XE1 - PAØ - HB8 - G5
W5ML	38	10	VE3-XE1
W6UXN	38	9	VE3-7
W8ZVY	38	10	KL7-G5
W6OVK	37	10	VE1, 2, 3, 7-KH6
W8QYD	37	10	VE1, 4-OA4-G5
W2IDZ	37	10	VE1, 7 - G5 - G6-PAØ - F8
W4QN	37	10	VE2, 3-OA4
W6OYK	37	10	VE1, 2, 3, 7-KH6
W7DYD	37	10	VE1, 7
W9UNS	37	9	
W5VV	36	10	VE7-XE1
W7FDJ	36	10	VE1, 7
W5FSC	35	9	VE1, 3, 7-XE1-OA-KL7
W2RLV	35	10	VE1, 3, 7-KL7-G2, 5, 6 - PAØ
W1GJZ	35	10	G5, 6 - HB8 - PAØ
W5HF	35	10	VE1, 3, 4, 7
W1JLK	35	10	VE7-G5
W2BYM	34	10	VE1-VP7
WØDKS	34	10	VE3
W5FRD	34	10	VE7-XE1
WØJHS	34	10	VE1-2
W7GPA	34	10	
W4WMI/4	33	10	VE1, 2, 3-VP7
W1HDQ	33	10	VE1 - G5 - G6-PAØ
W6BPT	33	10	VE1, 2, 3, 7-KH6
W4DRZ	33	10	VE1, 2, 3
W6PUZ	33	10	VE3-7
W7KAD	33	10	VE7
W9PK	32	10	VE3-7
W1CLH	32	10	VE7-G5-G6
W6FPV	31	10	VE1, 2, 3-KH6
W4FBH	31	10	VE1, 2, 3-XE1
W5LCZ	31	10	VE3-XE1
W3OMY	31	10	VE1-VP7
W9ALU	31	10	VE1, 2, 3, 4-G5-KL7
W3RUE	31	10	VE1-G5, 6
W4HVV	30	10	VE1, 2, 3
W9UIA	30	10	VE1, 2, 3
W5WX	30	10	VE4, 7-XE1
W4EQR	28	10	
W6ANN	28	9	VE3-7
W1CGY	28	8	VE1- G5 - G6-PAØ
W4FQL	28	9	VE1
W7ACD	27	8	
W5LBG	26	8	VE7-XE1
WØDNW	26	10	
WØYKX	26	10	VE2, 3
W7BOC	26	9	VE1
W6NAW	25	9	VE7
W5ESZ	25	8	VE7
W4FNR	25	8	VE3-OA4
VE1QZ	24	8	VE1, 2, 3, 7-G2, 3, 5, 6-F8 - HB8 - PAØ
VE1QZ	24	8	VE1, 3-G-PAØ-F7-HB8
W7JPA	24	8	VE7
W5LIU	24	8	
G5BY	23	8	W1, 2, 3, 4, 5, 8, 9, Ø-VE1, 2, 3 - MD5 - SU1-ZS1
W8MVG	23	9	VE1-PAØ-G5, 6-PAØ-F8
W9AB	23	9	VE1, 2, 3, 4
W7CTY	21	9	VE7
W4JML	20	9	VE2-3-G5
W7ACS/KH6	3	3	W5, 6, 7-J9-VK5-KH6



ESSE Specials!

Do not fail to closely examine this list of bargains. We believe that every item listed below is a sensational value that soon can never be repeated. All equipment advertised herein is unconditionally guaranteed to the customers satisfaction to this extent: Return any item advertised within five days after delivery for full refund except transportation charges (both ways.)

Below are listed surplus radio and electronic supplies that are too numerous to picture. Every ham and operator is familiar with these items. See our previous ads for pictures and more complete descriptions.

RECTIFIER RA-63-A Battery charger or rectifier, or power supply units. 110 V. 60 cy. input; 12 V. 8 amp. output. Brand new **$19.75**

ARB (CRV-46151) AIRCRAFT RADIO RECEIVER 6 tube, 4 band, euperheterodyne rec. with built-in dynamotor. Designed for reception of MCW, (tone or voice) or CW within the frequency range 195 Kc. to 9.05 Mc. We bought a carload of these in order to sell them at this price **$19.50**

BC-221 FREQUENCY METER Covers 125-20,000 Kc. Battery or 110 V. AC, vibra-packed operated. A beautiful instrument **$49.95**

T-17-B CARBON MICROPHONES Handmike, Brand new **$1.00**

HS-33 HEADPHONES, 600 ohm. (Used) . . . . **.75**

HEADPHONE EXT. CORD . . . . **.50**

TELEGRAPH KEYS, New . . . . **.45**

IF AMPLIFIER STRIP 19 Mc. containing 5 WE 7-17A tubes **$3.95**

INTERVALOMETER Electronic timing device. Was used for releasing bombs at intervals. Ideal for darkroom timer. model train controller. (Contains relays, switches, pilot light, resistors, knobs, etc.) **$2.25**

WILLARD LEAD ACID CELLS
6 V. (dry-chgd.) **$3.00**
6 V. (in metal carrying case (dry-chgd.) **$4.00**
(add electrolyte, specific gravity 1.265—drugstore)

BC-375 GE MOPA XMTR. The most famous of all surplus transmitters. Was used by the Army bombers and ground stations during the War. Frequency range is covered by means of plug-in tuning units as shown below. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. FREQUENCY RANGE: 200-500 Kc and 1500-12,500 Kc. (Will operate on 10 and 20 meter band with slight modification.) OSCILLATOR: thermo-compensated, and hand calibrated. POWER AMPLIFIER: neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class "B"—uses two 211 tubes. POWER SUPPLY: Dynamotor which furnishes 1000 V. at 350 Ma. Conversion instructions and diagram for 110 V. AC furnished upon request for **$1.00.**

PRICES: As follows—

Transmitter only	**$19.50**
Tuning units TU-5B, TU-6B, TU-7B, TU-8B, TU-9B, TU-10B, TU-26B, choice . .	3.75
Dynamotor PE-73C	4.95
Antenna tuning unit (BC-306A)	4.95

BC-357 MARKER BEACON RECEIVER

Ideal for controlling remote circuits and model aircraft, boats, etc. Operates about 75 Mc. Signal easily altered to 2-meter band. Tubes used and included: 12C8, and 12SQ7. Also sensitive relay. Circuit diagram inside case. Size, 5 3/8 x 3 3/8 x 5 ¼". For 24 V DC operation **$2.95**

RADIO ALTIMETER INDICATOR 1-152-AM Includes 3DP1, 2x2, and 3 type 6AG5 tubes. Powered by 110 V. 400 cy **$8.75**

T-39/APQ-9 RADAR TRANSMITTER Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2—RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air-cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2—6AC7's, 1—931, and 1—6AG7 tubes, ceramic switch, potentiometers, gears, revolution counter, etc **$12.50**

APN-1 RADIO ALTIMETER A complete 460 Mc. radio rec. and trans. which can be converted for ham or commercial use. Tubes used and included: 4—12SH7, 3—12SJ7, 2—6H6, 1—VR150, 2—955, 2—9004. Other components such as relays, 24 V. dynamotor, transformers, pots, condensers. etc. make this a buy on which you cannot go wrong. Complete in aluminum case 18 x 7 x 7 ¼" **$8.95**

INTERPHONE AMPLIFIER We've sold thousands of these. Every ham and experimenter could use several at our low price. Type AM-26/AIC with 28 V. DC dynamotor. Contains 2—12A6 and 2—12J7 tubes. Easily converted for phonograph or inter-communication amplifier. A steal **$1.75**

BC-966-A IFF Approximately 2-meter operation, 14 tubes, 350 V. DC dynamotor, 12 V. DC input. Contains voltage regulators and many other fine parts. Worth much more than our price for parts **$4.75**

DETROLA AIRCRAFT RECEIVER If you want a good 28 V. DC operated 200-400 Kc. aircraft receiver—just don't pass up this bargain. A few left at . . . **$4.75ea.**

LANDING LIGHTS—AIRCRAFT 24 V. retractable, 600 watts **$3.95**

BC-348 COMMUNICATIONS REC. The finest of all surplus receivers. **$69.50**

BC-348 110 V. Power supply ... **$8.95**

SCR-625 MINE DETECTOR (Brand New) The most sensitive mine detector on the surplus market, For miners, treasure hunters, plumbers, etc. **$79.50**

AN/PRS-1 MINE DETECTOR (Brand New) A very dependable detector, Only. **$14.95**

TURBO AMPLIFIERS Use for parts or small phono amplifier, shipped complete with the following tubes: 2—705's, 1—7Y4, 1—7F7. Our greatest bargain each......................... **$1.65**

IF TRANSFORMER, 19.2 Mc. ea...**20**

TELRAD 18-A FREQ. STANDARD Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply for 110, 130, 150, 220, and 250 V. 25-60 cy. AC. Complete with tubes, dual crystal, and instruction book. One of the best buys on the surplus market today. Brand new............. **$24.95**

BEAM ROTATING MOTORS Look at other ads for more complete descriptions. Fellows, we've sold hundreds of these. Every ham shack cannot afford to be without one.

24-28 V. DC motor............ **$9.95**

24-28 V. motor with beam mounting plates attached.............. **$14.50**

Transformer to operate beam motor on 110 V. (New)............... **$4.95**

SELSYN INDICATORS for beam rotating motor (operates from 15-25 V. 60 cy. AC supply). Choice of 5" or 3" model each................ **$2.85**

BL SELENIUM RECTIFIER (New). **$1.25**

RADIO SET SCR-510 (New).. **$49.75**

COLLINS AN/ART-13 XMTR. A compact, light-weight, modern, high-powered transmitter. Frequency range 2-18-1 Mc. on any of its 11 auto-tune crystal controlled or master oscillator channels. Dec. 1947 "Radio News" gives conversion data for converting 24 V. DC operation to 110 V. AC. These are in exceptionally fine condition, tested in our labs. Wgt., 67 lbs. (Dynamotor included)....... **$134.50**

R-89-ARNS GLIDE PATH REC. 326-335 Mc. on any of 3 pre-determined crystal controlled frequencies. Contains 11 tubes, 6 relays, and other valuable parts. For 24 V. DC operation, Size, 13 3/4 x 5 1/4 x 6 3/8"......... **$7.95**

AIRCRAFT SUPPLIES These instruments have all been tested for accuracy.

Sensitive Altimeters.......... **$9.00**

Gyro - horizons.............. **$7.50**

Magnetic Compasses.......... **$6.00**

MN-26 Radio Compass (Brand New) **$69.50**

SCR-269F Radio Compass (Brand new)...................... **$69.50**

Astro Compass. These are beautiful instruments that should sell on the regular market for many, many times our price. They have various uses including those of the Yachtman as well as the airman. If you desire, send for more complete descriptive literature. **11.50**

BC-733D LOCALIZER REC. A part of aircraft blind landing equipment. Operates on any one of its 6 predetermined crystal controlled frequencies in the range of 108-120 Mc. Contains 10 tubes—6 of which are W.E. 717-A's—and crystals. Ideal receiver for conversion to 144 Mc. ham band or mobile telephones bands. For 24 V. DC operation. Size, 14 1/2 x 7 x 4 5/8". Complete with dynamotor................ **$4.95**

THROAT MIKES, 7 for......... **$1.00**

NAVY HOSPITAL TENTS These large, brand new, fire-resistant, fungus-proof, water-proof, heavy canvass tents are of the finest grade canvas with tie-down ropes, in canvas carrying bag. Wgt. 365 lbs. Size, 16' width, 50' long, 12' apex, 4' sidewall. We have but 20 of these left and must sell them immediately. Can be used to house automobilss, machinery, side-shows, or various purposes. Our sacrifice price **$185.00**

LIFE RAFTS—Off-Season Sale Large size rubber floats, ideal for fishing and boating. Sold in an "as is" condition—some need minor repairs and inflation valve inserted............ ea. **$12.50**

C-1 AUTO PILOT AMPLIFIER Were used to control operation of Servo-units, causing them to move the control surface of airplane in one direction or the other in response to signals received. The complete amplifier includes one rect. 7Y4, 3—7F7's for amplification and control, 3—7N7's for signal discrimination, 1 power transformer, 6 relays, 4 control pots, chokes, condensers, etc. Convert for use on radio controlled models, doors, etc. Operates from 24 V. DC, Size 9 1/4 x 6 1/4 x 7 5/8" Complete **$3.95**

SCR-274N COMMAND SET COMPONENTS (ARC-5) Modulator with dynamotor..................... **$5.75**

Trans. 4-5.3 Mc.................. **5.75**

Trans. 5.3-7 Mc.................. **5.75**

ESSE Radio Co

40-42 W. SOUTH STREET
INDIANAPOLIS 4, IND.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

ESSE *Specials!*

MINE DETECTOR SCR-625

Brand New

ATTENTION: LUMBERMEN, PROSPECTORS, MINERS, PLUMBERS, OIL COMPANIES, ETC.

Below is a description of one of the finest metal detecting Mine Detectors ever built.

Operates in the manner of aural and visual method.

If you are looking for metal buried in logs, pipes in the ground, ore bearing rocks, underground cables, metallic fragments in scrap materials, metallic money buried or hidden in undetermined places this Mine Detector will probably surpass anything that was ever built. The United States Forestry Service has recommended procedure for using this detector to find concealed metal in tree logs and other timber products. Our government is reported to have paid several times the amount of our prices. They originally were sold by War Assets to jobbers for $166.00.

Unit consists of a balance inductance bridge, a two tube amplifier and a 1000 cycle oscillator. The presence of metal disturbs the bridge balance resulting in a volume change of the 1000 cycle tone. Tubes used are low battery drain types such as 1G6 and 1M5. The circuit may be modified for control of warning signals, stopping of machinery etc., when metal is detected.

Operates from two flashlight batteries and 103 v (B). However a power supply operating for 100 v may be used.

This unit is brand new and comes complete with spare tubes, spare resonator and instruction manual—in wooden chest 8¼ inches x 28¼ inches x 16 inches. Weight in operation is 15 pounds. Packed in original overseas container.

We do not know exactly what the deepest possible penetration would amount to when this detector is used but we have had customers who have bought the detectors with the expectations that the detector would locate metallic objects buried several feet under the ground or under water and we have had absolutely no complaints whatsoever regarding the detector not living up to the customers expectations.

We can not over emphasize our belief that if an Army surplus mine detector could solve your problems in detecting metal that this detector should fill the bill.

Our price is
Shipping Weight
125 pounds

$79.50

NOTE: Batteries are not furnished, we can supply for $4.50 extra.

140 W. New York Street
Indianapolis 4, Indiana

February 1, 1948

To Our Many Many Customers All Over the World
Hello Everybody:

Esse Radio Company extends to its customers sincerest thanks for all past business. Our Company has really done a tremendous job of selling of surplus electronic equipment and we believe that we have supplied our customers with the finest possible equipment at the lowest prices.

Throughout 1948, Esse Radio Company will continue to supply its customers with every available piece of radio or electronic equipment that is left on the surplus market.

Although the various surplus items are rapidly disappearing from the supply houses, we are still receiving truckload after truckload of equipment from our exclusive supply bases. We do not attempt to state how long our present supply of this equipment will last or how much more we will be able to buy in the future; however, you may be assured that we are canvassing the markets of the World and are not passing up any possibilities of keeping our store and warehouses supplied with every conceivable piece of electronic equipment that is available that we think would interest our customers.

All of our customers can be of some help to us by watching for leads and turning them over to us that might result in our buying from radio supply houses or jobbers or manufacturers a new stock of something different. Remember that we have buyers that we can and would send at a moment's notice to any place where there is a possibility of a new supply field. If one of you should give us a lead that is new to us and that should result in our purchasing equipment, we would send you immediately a gift for your shack that will probably be above your expectations.

Look to Esse—it pays—not only now, but in the future. When it's in the electronic and radio line—that's our field—we probably have it.

73's

Ben L. Selig

W9OVG

ESSE Radio Co

40-42 W. SOUTH STREET
INDIANAPOLIS 4, IND.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED
WITH ALL ORDERS
Orders Shipped F.O.B. Collect

V.H.F. - U.H.F.

(*from page 52*)

call. A 6 meter rig is planned as soon as Keith gets a regular run, which should mean more fun come this summer's Es.

From G2XC's column in *Short Wave Magazine* we find info on MD5KW, in the Suez Canal Zone. The rig at MD5KW is 35 watts to an HK54, 4-element rotary 35′ high, with S27 receiver. Both manual and auto keying is used for about 8 hours daily and any reports will be most welcomed. So far he has heard only W1HDQ and W2AMJ from the U. S. A., but has worked G-ZS-VQ two-way on 50 mc.

Ed Poledo, LU5CK, in Buenos Aires sends a list of the happenings in South America on Es contacts. There were only 4 days in November that contacts were not made from LU to OA4BG, OA4AE, PY2-QK, LU9MA (near Chilean border), PY1GJ, PY1-DS, PY2AC and CE1AH. No signals from XE1KE have been heard in S. A. since Oct. 19, when the F2 subsided in the southern hemisphere.

On Nov. 2 W2AMJ worked W5BSY/MM in the Maderia Islands, off the coast of N. Africa on c.w. with an S8 report. This shows the path to N. Africa has been open, but just no activity to cash in on it.

W6UXN received a heard report from a commercial operator in the Canary Islands on Nov. 23, at 1230 EST. The location being just south of where W2AMJ worked W5BSY/MM on the 2nd.

OA4AE in Lima, Peru, heard W6QG on Nov. 15 calling CQ at 1352 and again at 1414 EST S3. Nov. 23, Buzz heard W5VY at 1138 EST S3, but contact could not be made with either station.

XE2C, in Monterrey, Mexico, is now working on a new final with a 4-250A, which should be on soon. Gilberto heard over 20 stations in W3-4-5-6-9-Ø last summer on Es, using a two-tube super-regn and 4-element beam, so it looks good for this summer, now that XE2C has a rig on.

VE1QZ, Oscar Landoz in Halifax, N. S., has worked 142 different 50-mc stations including 17 Gs, 1 F8, 1 HB, 2 PAØs, 16 W6s and 17 W7s. Oscar hopes to be on 235 mc by spring for some DX tries.

A letter from OA4AE, says he hopes to be in the States on vacation early in '48, and will have a mobile rig on 10-6 meters. Buzz plans to drop by most of the fellows shacks he has QSOd on 6-meters and pay them a fast visit. Incidently, Buzz, thats just what XE1KE is doing during the Christmas holidays.

VE3ANY, v-h-f columnist in *XTAL*, mentions that VE7AEZ has worked 38 states in the U. S. A., and on Nov. 23 VE7AHZ-VE7BQ worked VE1QZ for the 1st trans-Canadian 50-mc QSO.

Naturally with all the DX being worked, we run across oddities. W6QXB worked W7ACS/KH6 using 3 watts to a TBF in his car, with a vertical half-wave antenna. W5ZZF in Big Spring, W. Texas, drilled holes to G5BD, G6XM with 13 watts to a 522, also hearing G5BY, G5BM and PAØUN on Nov. 22. Incidently this is the farthest west that Europeans have been worked, although G5BY heard W6UXN Nov. 24, at 1217 EST. W1MUX worked G5BY, Nov. 29 at 0845 EST running 3 watts to a folded-dipole antenna in his basement!!

Last month your columnist bemoaned the fact that WØs were left out of the DX, situated as we are in the middle of it all. Things finally came about, when WØIFB contacted G5BY at 1030 CST Nov. 22. Other openings were on 23, 24, 26 and 27 when

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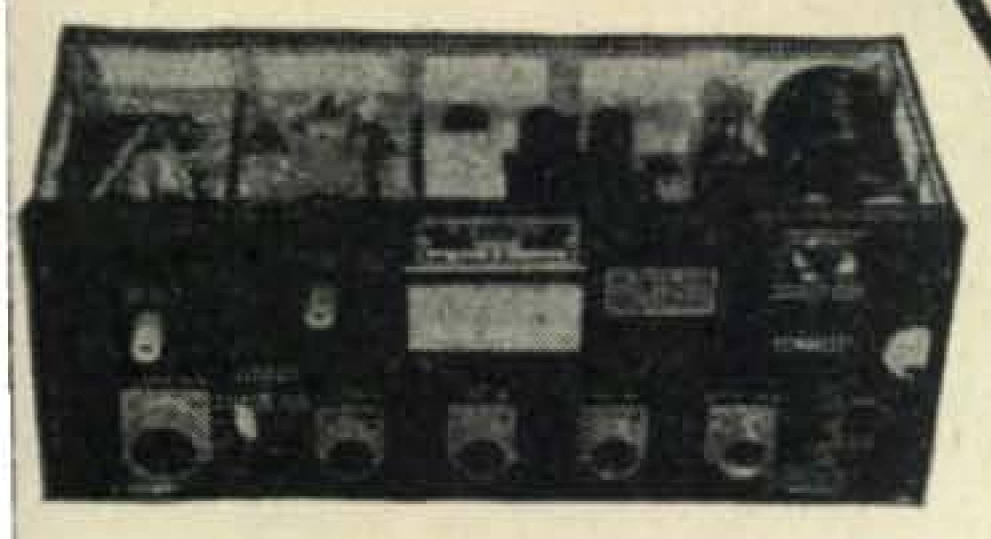

RADIO ALTIMETER APN/1

A complete 460 mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6, 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V dynamotor, transformers, pots, condensers, etc., make this a buy on which you can not go wrong. Complete as shown in aluminum case 18"x7"x 7¼

$8.95

New WILLARD RECHARGEABLE STORAGE BATTERIES

New 6 volt battery in spill-proof clear plastic case, housed in metal case for easy mounting. Applicable for a wide range of uses where battery power is needed. Shipped dry. Uses standard battery electrolyte available everywhere.

Price, each	4.00
Lots of Ten	3.35
Without metal case, each	3.00
Lots of Ten	2.95

AN/ART-13 COLLINS

AUTO-TUNE TRANSMITTER

Light weight, high powered. Frequency range 2-18-1 MC on any of 11 autotune crystal controlled or master oscillator channels. Easy 24V. DC operation to 110 V. AC conversion. In fine condition. Weight 67 lbs. (Dynamotor included)

$134.50

NAVY CRV-46151 AIRCRAFT RADIO RECEIVER

$19.50

Four bands, including broadcast (195-9,050 KC). Circuit is six-tube superheterodyne with mechanical band change or remote operated electrical band change. Remote band change and tuning controls included, making this set readily adaptable to mobile ham use. Powered from self-contained 24 V. DC dynamotor. The sets are complete with tubes, mounting rack and remote controls. No cables.

AIRCRAFT XMITTER BC 457A or BC 458A

$3.95

Ideal to make over for master oscillator. Priced complete with tubes. Has built-in crystal for dial calibration. Used but in good condition. 5.3-7 MC or 4-5.3MC. FREE: Mounting Rack with order of two or more.

R-23 ARC5

Aircraft Receiver

This Receiver is very selective and sensitive; has RF stage and BFO. Offered complete with tubes 11K8, 3—12SK7, 12SR7 and 12A6, also dynamotor which snaps on Receiver Chassis. Used but good condition 190-550 KC Receiver as above. FREE Mounting Rack with order of 3 or more.

$3.95

BC-348

COMMUNICATIONS RECEIVER

Excellent selectivity, sensitivity and stability makes this the most outstanding of any receiver yet available from government surplus. This receiver will give outstanding performance wherever used. Built to withstand vibration and features gear driven 100-1 ratio vernier tuning control. Six bands—500 Kc. and 1.5-18 Mc. Two stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. DC dynamotor. Easily converted to 110 V. AC operation.

BC-348, 110 V. AC power supply, including simple conversion instructions $8.95

$69.50

ARC-4 Transmitter and Receiver (Including case)	$17.95
Interphone Amplifier	$ 1.75
ART/13 Control Head with Connecting Plug	$ 2.50
Dynamotor Modulator Unit	$ 2.75
Antenna Relay Unit	$ 1.95

OXYGEN TANKS

These oxygen tanks, removed from surplus aircraft have a capacity of 500 lbs. pressure. Type D2, with complete regulator assembly. Size of tank 22"x5".

$6.95

TERMS: CASH WITH ORDER

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ALL PRICES F.O.B. Indianapolis

WØHAQ, NFM, OJA, KYF, TOZ, ZJB got G5BY; well yuh gotta gripe a little don't yuh, huh?

Here are the day-by-day results of the happenings on 6 meters, as reported to us, starting with Dec. 22.

Nov. 22: W2AMJ worked some nice ones from 0829-1227 EST with these: G5MQ, G5BM, G5ZT, G5BD, G6DH, G6LK, G6XM, F8OL, HB8VK, PAØPAX, W6GGM, and heard PAØWL, W1CLH hooked G5BY S9 at 0943 EST. W7FS/MM's report was given under international news. G5BY knocked off between 0742-1218 these: VE1QZ, W1HMS, LLL, BWJ, GJZ, FZ, CLH, HIL, PZG, KEX, on 50.85 mc, W2IQQ, JPX, W3OR, KFM, IUN, MKL, HC, W5AJG, W8ZVY, W9HGE, ZHL, ZHB, WØIFB, VE3AXT; and heard W4WMI, WØKYF. W7QLZ heard FM and video up to 48.7 mc from 1045-1130 MST. VE2KH heard G5WC, BY, ZT, at 1142 EST. W8MVG worked G5WP and G6LK between 1100-1115 EST. W1NF ran up these; G5ZT, MQ, BM, G6XM, LK, PAØUN; hearing G5BY, BM, G6DH and F8OL from 0852-1146 EST. W5VY snagged: G5WP, MQ, BM, G2AJ, G6DH, LK, F8EFR, PAØUN from 0945-1030 CST, band condx excellent. W2IDZ came out with: G5BY, BM, WP, G6LK, G5ZT, and heard G5MQ, BD, and PAØUN. W1GJZ worked from 0840-1003 EST; G5BY, BM, WP, BD, ZT, G6LK, DH, XM, PAØUN. W5AJG from 1012-1033 CST worked G5BD, BY, ZT, and heard G6LK with excellent condx. W9ZHL got HB8VK at 1025 CST with fair condx. W5JLY made it with G5ZT, G6DH and PAØUN from 0957-1018 CST, good condx.

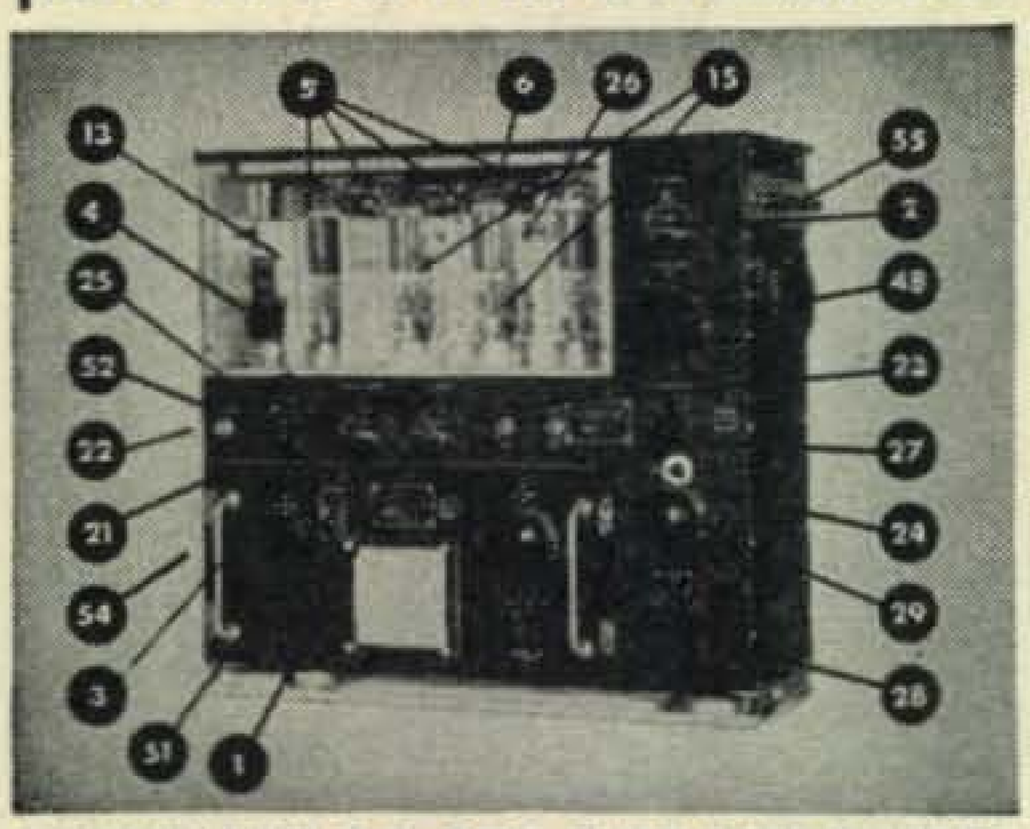
Nov. 23: OA4AE heard W5VY at 1138 EST S3, Elmer Walker near Seattle, Wash., heard: W1BWJ, HMS, AF, NX, GJZ, CJL, PNB, KHL, PNB, IN, HDQ, LLL, LIY, HDF, CLH, W2BYM, BQK, NPH, LAL, CUZ, AMH, W3OR, VE1OD, QZ, QY, all from 0920-1157 PST. W8MVG hooked from 0955-1115 EST: G5ZT, G6DH, F8OL, PAØWL, PAX, GN. W2AMJ had QSOs with: G5BY, G2BMZ, G3APY, G6DH, VX, W6OVK, W7BQX, FP, BOC, HEA, ERA, and heard PAØUN, GN, F8OL, from 0850-1327 EST. W5AJG got HB8VK, and PAØWL; hearing HB8VD, PAØUN, GN, between 0940-1030 CST. W2IDZ worked G5MA, BY, G6VX and F8OL, and called PAØUN, G2BMZ, G5BD, W6EUL, OVK, CAN, UXN, W7BQX, DF, FP and W7FDJ. W1CLH hooked G5ZT, W7JPA, and heard PAØUN, G5BM, ZT, G6DH, LK, W6KEV, AMD, UXN, EUL, W7FFE, DYD, FDH, BOC, FP, DF, DMN, all from 1105-1330 EST. VE3OJ heard from 1140-1246 EST: G2BMZ, G5ZQ, BY, G6DH, W6UXN, GIZ, ANN, WGM, OB, YOV, EUL, BPT. W7ERA QSOd from 0925-1210 PST: W1GJZ, BWJ, CHL, AEP, IN, HDQ, AF, W2CUZ, AMJ, VE1QZ, VE1OD, and heard VE1QY. W5VY, the Alamo Kid, tore into these: HB9CD, HB8VD, VK, PAØGN, WD, W4QN, (Es), from 0930-1032 CST. G5BY waded in and came out with: W1LLL, NF, IN, GHZ, ATP, CLS, KVX, KMZ/3, W2IDZ, LAL, RTX, W3CGV, KFM, W4GLV, HVV, W8QYD, TDH, KQC, W9HGE, ZHB, ALU, VZP, JMS, WØIFB, HAQ, KYF, NFM, OJA, and heard harmonics of HSC in Siam on 50.32 mc at 0432 EST and VE1QZ, W5FRD, W8RFW, W9ZHL from 0730-1240 EST. W5JLY worked HB8VD at 1018 CST and heard HB8VK, PAØUN from 0940-1030 CST good condx. W9ZHL made it with G5BY, BM and G6LK from 0940-1040 CST, good condx. W1NF got from 0810-1353 EST: G5BY, G6VX, W6GGM, QG, AMD, TMI, WGM, W7FDJ; hearing 2 TV stations in the west, and G5MA, BM, G6DH, F8OL, HB9BK, BZ, HB8VK, PAØUN, W7FP, EEF (Nev.). W7JPA worked W1CLH, W2CUZ, VE1OD; hearing W1MUX (3 watts). W1KEX, CLS, W2BYM, AMH, VE1QZ. W1GJZ, between 0845-1343 EST QSO'd: G5BY, ZT, G2BMZ, G6LK, PAØUN, HB8VK, W6ZOJ, UOV, EUL, WGM, GGM, W7ERA, FFE, HEA, DYD, BQX, DF, very good condx. W6IWS found W1CLS, HDQ, PNB, W2BQK, GYV and VE2KH for QSOs from 0905-1010 EST. W9ALU skipped into G5BY and G5BM from 0934-1000 CST. W7QLZ worked VE1QZ, W1CLS, LSN, and heard G6LK from 0900-1130 MST. W6BTP got VE2KH, VE3BBM, W1KVX, BKE, CLS, W2NNT, SIN/1 from 0939-1102PST. W2RLV in W. N. Y. made it with G2AJ, G6LK, PAØGN, W6GGM. W7DYD tore into W1BWJ, GHZ, W2MPJ, CUZ, W4WMI, VE1QY, OD, QZ, and heard W1HDQ, RX, LIY, CJL, CLH, HMS, LLL, W2IDZ, AMJ, QVN, W3OR, GKP. VE2KH had better luck and worked: G2BMZ, G6LK, W6ANN, BPT, IWS, GGM; and heard: G5BY, BM, ZT, PAØUN, W6TIC from 0935-1305 EST. W8ZVY got: PAØWL, G5BY, BM, G2BMZ, G6DH. W8QYD worked G5BY and BM between 1100-1133 EST. W3RUE finished with: G5BM, G2BMZ, G5BY, G6LK, between 0930-1040 EST. W9ALU

WAR SURPLUS BC-375-E TRANSMITTER

With thousands of usable standard radio parts

$24.50 COMPLETE
(Gov't cost, $1800)
Wiring & Conversion Diagram FREE

PARTS ALONE WORTH HUNDREDS OF DOLLARS TODAY! Use it for parts or use it as a transmitter



COMPLETE BC-375-E TRANSMITTER

You get all this: transmitter, tubes, ant. loading unit, dynamotor, five tuning units.

METERS
- **1.** (1) 0-15V AC. DC., GE
- **2.** (1) 0-8A RF with thermocouple, GE
- **3.** (1) 0-500 MA. DC., GE

TUBES
- **4.** (1) 10Y (VT-25)
- **5.** (4) 211 (VT-4-C)

COILS
- **44.** (3) RF chokes
- **45.** (1) AF choke .5 hy .1 amp
- **46.** (1) Parasitic Suppressor
- **47.** (1) Tapped antenna loading coil on ceram c form

COILS *(continued)*
- **48.** (1) Continuously variable antenna loading coil with dial-ceramic form

SWITCHES
- **21.** (1) Interlock
- **22.** (1) Test
- **23.** (1) SPDT Toggle
- **24.** (2) DPST Toggle
- **25.** (1) 3 pos. Mallory w/bar knob
- **26.** (1) SPDT Toggle
- **27.** (1) 4 pos., 3 sec. hi voltage band switch w/bar knob
- **28.** (1) 5 pos. hi voltage, band switch w/bar knob

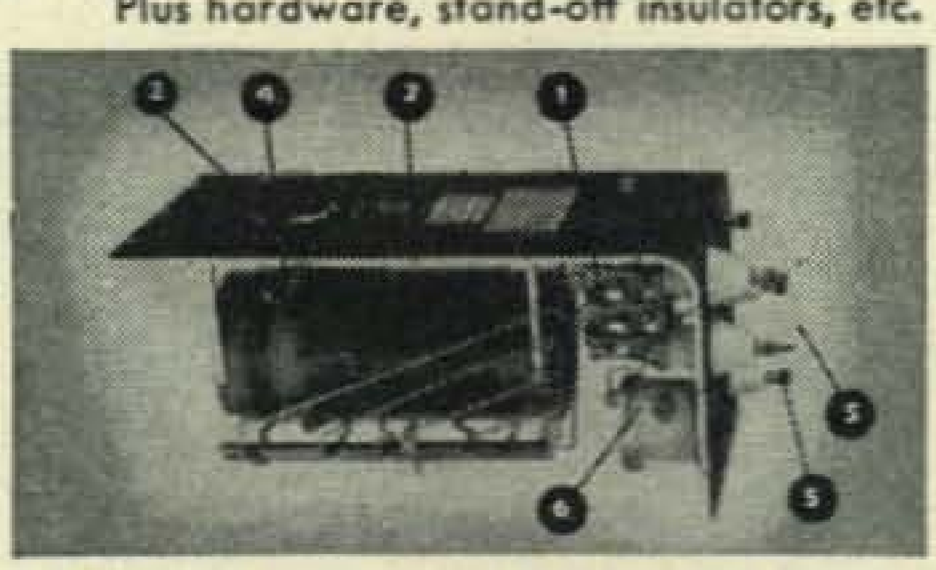
RESISTORS
- **6.** (1) Tapped Resistor 2.7 ohms, 36 watts—3.7 ohms, 26 watts
- **7.** (1) 5 ohms 2 watt, IRC
- **8.** (2) 5 ohms 12 watt, IRC
- **9.** (1) 50 ohms 4 watt, IRC
- **10.** (1) 100 ohms 12 watt, IRC
- **11.** (1) 150 ohms 8 watt, IRC
- **12.** (1) 200 ohms 2 watt, IRC
- **13.** (1) 200 ohms variable, Mallory
- **14.** (1) 2500 ohms 15 watt, IRC
- **15.** (2) 3000 ohms variable, Mallory
- **16.** (1) 4000 ohms 15 watt, IRC
- **17.** (3) 11000 ohms 12 watt, IRC
- **18.** (1) 30000 ohms 1 watt, IRC
- **19.** (1) 200000 ohms 1 watt, IRC
- **20.** (4) 250000 ohms 1 watt, IRC

CAPACITORS
- **29.** (1) 22-118 mmf. variable with vernier dial
- **30.** (1) tube thermal compensating and calibration reset capacitor
- **31.** (2) .0001-1000 V, CD, mica
- **32.** 1) .006-2500V, CD, mica
- **33.** (2) .001-2500V, CD, mica
- **34.** (1) .001-4500V, CD, mica
- **35.** (1) .02-1000V, CD, mica
- **36.** (1) .01-1000V, CD, mica
- **37.** (1) .01-2500V CD, mica
- **38.** (3) 1-300V, CD, mica
- **39.** (1) 1-1-1 3000V GE, pyranol
- **40.** (1) 25 mfd 25V, CD, electrolytic

TRANSFORMERS
- **41.** (1) Microphone trans. single button mic. to single grid
- **42.** (1) Interstage transformer single plate to push-pull grids.
- **43.** (1) Modulation transformer — class B mod. to class C plate

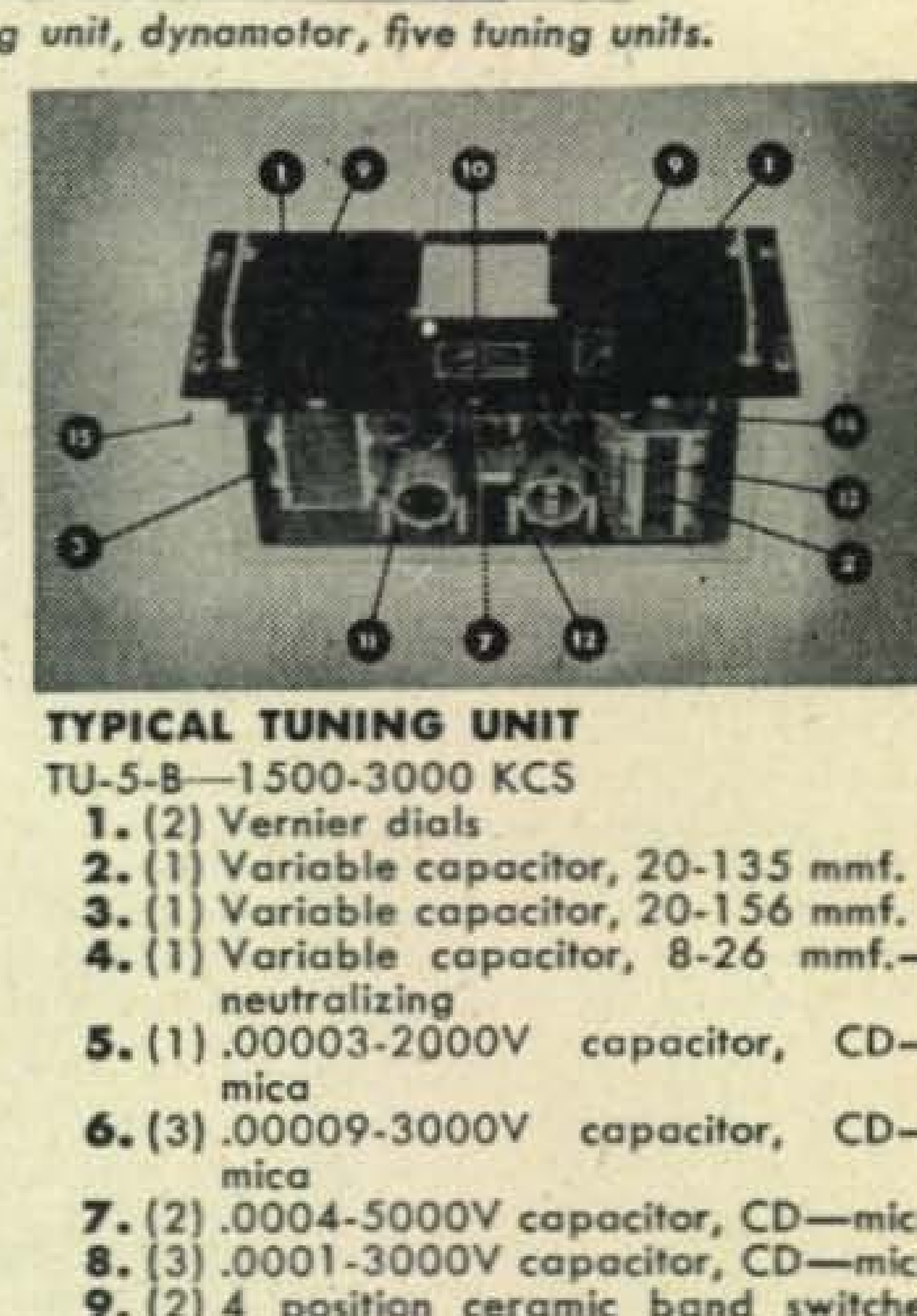
MISCELLANEOUS
- **49.** (1) 8 contact antenna relay—28V D.C.
- **50.** (2) Ceramic insulated flexible couplings
- **51.** (1) 6.3V dial lamp and socket
- **52.** (1) mic. jack
- **53.** (2) .5A-1000V Fuses
- **54.** (3) Sockets with plugs
- **55.** (5) Binding posts

Plus hardware, stand-off insulators, etc.



BC-306-A ANTENNA LOADING UNIT
- **1.** (1) 3 Gang, 5 position, high voltage band switch
- **2.** (1) Tapped inductance with variometer tuning
- **3.** (1) Vernier dial
- **4.** (1) Ceramic insulated flexible coupling
- **5.** (2) Bee-hive feed-thru insulators
- **6.** (1) Capacitor .00024-6000V SANGAMO

SAVE C. O. D. CHARGES by remitting in full direct—or send 25% deposit with all orders. Shipment made direct from whse. in Okla., Ariz., Ark. or Virginia.



TYPICAL TUNING UNIT

TU-5-B—1500-3000 KCS
- **1.** (2) Vernier dials
- **2.** (1) Variable capacitor, 20-135 mmf.
- **3.** (1) Variable capacitor, 20-156 mmf.
- **4.** (1) Variable capacitor, 8-26 mmf.—neutralizing
- **5.** (1) .00003-2000V capacitor, CD—mica
- **6.** (3) .00009-3000V capacitor, CD—mica
- **7.** (2) .0004-5000V capacitor, CD—mica
- **8.** (3) .0001-3000V capacitor, CD—mica
- **9.** (2) 4 position ceramic band switches
- **10.** (2) 2 RF chokes
- **11.** (1) Tank coil—ceramic form with tapped antenna coupling coil
- **12.** (1) Tank coil—ceramic form
- **13.** (1) Parasitic suppressor
- **14.** (2) Ceramic flexible couplings
- **15.** Plus banana jacks, stand-off insulators

PE-73 DYNAMOTOR
- **1.** (1) Dynamotor 28V DC input—1000V DC output—GE
- **2.** (1) Fuse, 30A 250V
- **3.** (1) Fuse, 60A 250V
- **4.** (1) Fuse, 1A 1000V
- **5.** (1) Relay, 24V D. C.
- **6.** (3) .005-5000V Capacitor, mica—CD
- **7.** (1) .01-1000V Capacitor, mica—CD
- **8.** (2) .01-600V Capacitor, mica—CD

R & M RADIO COMPANY

Dept. C-28—1425 N. QUINCY ST., ARLINGTON, VIRGINIA

made it to G5BY, and W9ZHB, Getting HB8VK at 1025 CST. W6OVK trans-con'd to get: W1BWJ, RX, HMS, FZ, DIC, HDF, LIY, ATP, CAU, OOP, KLQ, W2AMJ, W3RE, VE2AE, and heard W6UXN. W7HEA had QSOs with: W1CGY, GJZ, CJL, W2QVH, AMJ, W3OR, and VE1OD between 0926-1119 PST. W7BOC got to W1LLL, CGY, CJL, BWJ, W2CUZ, AMJ, BYM, from 0947-1040 PST.

Nov. 24: LU5CK reports the Buenos Aires' gang worked CE1AH around 1226 EST. W6IWS heard W2AMJ and W3OR very weakly around 0930 PST. W2AMJ worked G5ZT, BM, JU, F8NW between 0854-0934 EST. W7ERA heard W1CLS S9. W8MVG made it to G6DH, G5MQ and PAØGN from 0930-1020 EST. W7QLZ heard MUF of 46.2 mc around 0945 MST. G5BY rolled up these: W1KCQ, BNS, HDQ, PNB, AF, W2OUS, W3GKP, RE, RUE, CMS, CGV, W8RLT, KQC, W9HGE, ZHB, WØIFB, OJA, TOZ, ZJB, and heard WØQIN, WCC harmonic on 50.7 mc, W6UXN for 1st W6, also high-speed press on 50.32 mc from east and Siam again. 0515-1232 EST. W6UXN heard and called: G5BY, G5BM, G5WP, G6HI G6XM, PAØUN and F8OL from 0915-0934 PST. W7JPA had a quickie with W1CLS at 0953 PST. Walker in Washington State heard from 0915-0955: W1CLS, LSN, FZ, CHY, NWL, HMS, W3OR, VE1QZ.

KEN BILLINGS, W9FKI, RANTOUL, ILLINOIS

Nov. 25: This was a dead day to Europe, although the previous 10 days it had been open. W7QLZ heard an MUF of 44.8 mc. Walker in Wash. State heard W1CLS, HMS and VE1QZ from 0937-1019 PST with fair condx prevailing. W7-JPA called W1CLS at 1010 PST with no results.

Nov. 26: The band opened again for G5BY between 0806-1220 EST for: W1EYM, LLL, HDQ, W2AMJ, RTX, W8MVG, W8CMS, W9HGE, WØZJB; heard WØNFM. W8MVG Got G5BY, ZT, W1AF, WØNFM, from 1105-1135 EST. W7QLZ had an MUF of 40.2 mc. W2AMJ worked G5BM and G5BY twice, from 0844-0910 EST. XE2C had an MUF of 46 mc and heard FM stations from eastern U. S. at 1050 CST.

Nov. 27: W7JPA worked W1CLS and W1LSN from 0920-0950 PST. W2AMJ hooked G5MQ, HB8VK, W7FDS, W7FFE between 0850-1334 EST. G5BY ripped off: W1CLS, HDF, LSN, KHL, W2RGV, IDZ, PZG, BQK, RTX, NNT, OWC, W3OR, CGV, W8CMS, QYD, W9VZP, WØNFM, HAQ, ZJB; and heard VE1QZ, WØYSJ, between 0814-1224 EST. Walker near Seattle heard: W1CLS, SZ, CGY, KID, KDF, EHT, LSN, PUJ, EIO, MLS, HDQ, EAP, CJL, ATP, LLL, W2RYT, GYV, OUS, NPJ, SYR, AMJ, QVH, IDZ, BYM, W3OR, IDS, HC, VE7AEZ, BQ, NM. W7HEA worked: W1MUX, EHT, EYM, LRE, W2GYV, NPJ, from 0930-1005 PST with good condx. W8MVG hooked G5MQ, PAØGN, W4HVV, from 0930-1045 EST. W1CLH heard W7FIV, FDJ, DYD, FIM, FFE, HEA, FP, VE7AHZ, from 1240-1315 EST. W7-QLZ reports an MUF of 40.2 mc. W2IDZ got G5BY, W7CTY, and called G5BD, VE7AEZ and W7FFE. W7BOC hooked W1EIO, LLL, SZ, from 0930-0957 PST. W2RLV, made it to G5BD, G5MQ, W7JFS, ABC, KL7DY; and heard HB8VK between 0940-1255 EST. W1NF worked: G5BM, BY, W7FP, W7ERA had QSOs with W1CLS, SZ, LRE, KEX, W2NNT, GYV, BYM, from 0910-1025 PST, hearing W1CGY, EIO, PUJ, W2AMJ. W9AB heard and called: G5BY, KL7DY, W8MVG, WØNFM. W7CTY worked W1KEX and W2IDZ from 1005-1015 PST.

Nov. 28: W1NF worked G5BY, and heard G5MQ. W7QLZ observed an MUF of 42.3 mc. G5BY had good luck with: W1LLL, NF, HDQ, with bad QSB from 0813-1106 EST.

Nov. 29: W7ACS/KH6 broke into W6 to get: W6OB, QG, OVK, BPT, QFT, TJZ, YRL, AWY from 0900-0939 HST, all signals S9. W2IDZ heard G5BY. W7QLZ MUF'd to 46.2 mc. W1NF heard G5BY, G5MQ. G5BY had better luck getting: W1DJ, EKT, PBT, MUX, CLS, W2BQK, AMJ, W3OR, MQU all from 0816-0922 EST. W2AMJ got G5BM and G5BY. W6OVK hooked W7ACS/KH6 at 1115 PST, with S9 signals.

Nov. 30: This date found both F2 and Es skip, with the

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WØARA

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National NC57	89.50
National NC173	179.50
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National NC240D	225.00
National HRO-7	279.00
Hammarlund HQ129X	177.30
Hammarlund SPC400X	398.25
Hammarlund Four-20	120.00
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RME DB22A	66.00
Collins 32V1	475.00
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Signal Shifter model EX	99.50
Bud VFO-21	52.50
Millen 90800 exciter	42.50
Millen 90700 VFO	42.50
Millen 90281	84.50
Millen 90881	89.50
Millen 90810	69.75

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BC 733 D RADIO RECEIVER

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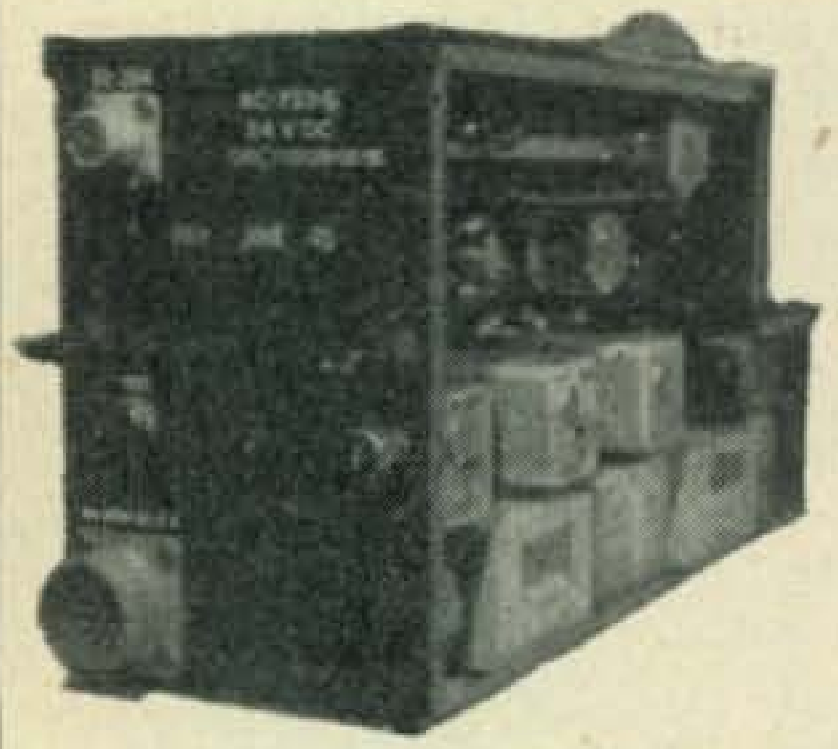
F-225



A part of aircraft blind landing equipment manufactured by W.E. Operates on any one of its pre-determined Xtal controlled frequencies in the range of 108-120MC. Contains 10 tubes, 3 of which are W.E. 717A's, and Xtals. Ideal receiver for conversion to 144MC. ham band or mobile telephone bands. For 24 VDC operation. 14½" x 7" x 4⅝". Complete with tubes.

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12,000,000 lumens light output—stops all action. Ignition coil included on back of bulb. 10,000 flashes. Diagrams furnished.

Complete line of GE photo flash tubes in stock.

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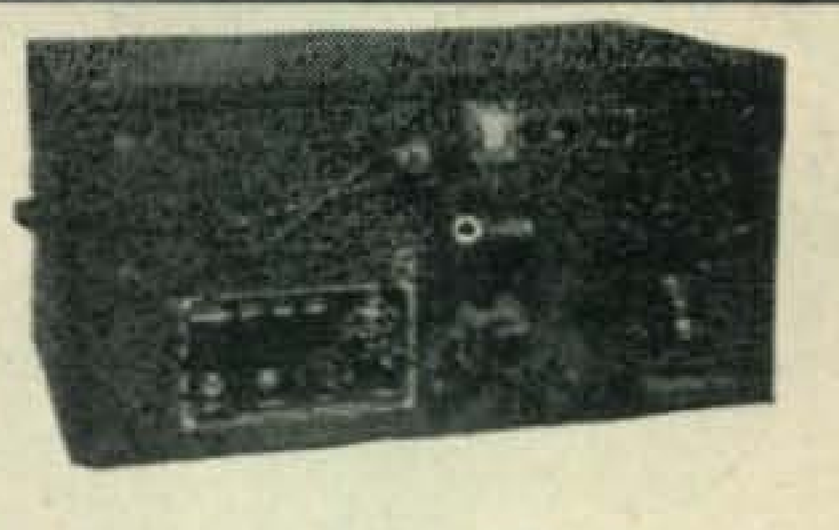
$9.95

F-300

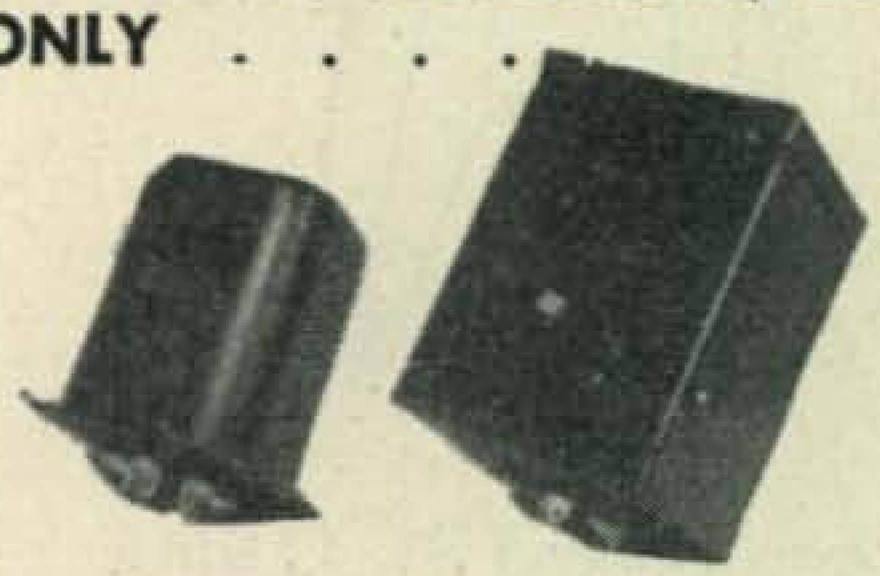


Makes excellent code practice machine, using tape or key. Variable words-per-minute adjustment. Clean-quick keying, using photocell. Operates on 110V 60cy. Slightly used but in excellent condition. Price does not include tubes.

MODULATION TRANSFORMER AND DRIVER TRANSFORMER, BOTH FOR ONLY . . . .

$4.95

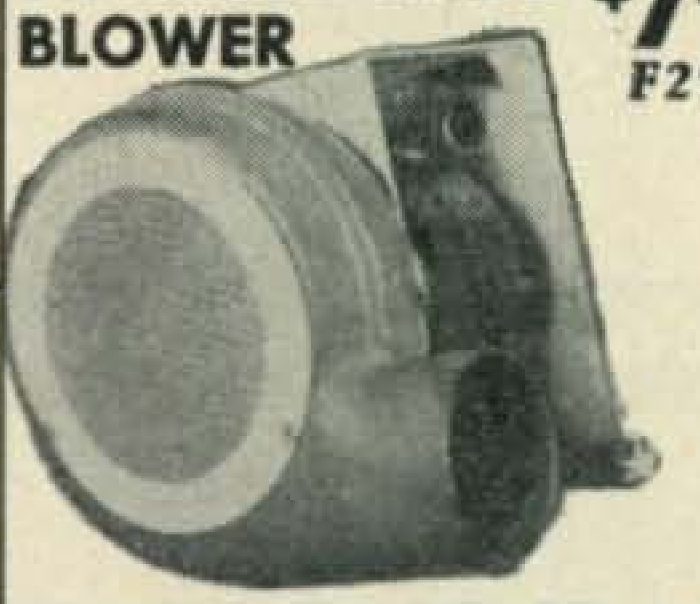
F-302



RC 1206 Mod. Trans. 815 to 815 Class "C" load 56W audio. RC 1205 Driver trans. 6SN7 to 815 Class "B". Companion to RC 1206.

SQUIRREL CAGE BLOWER

$7.95 *F258*



2" outlet, 110 AC. Silent ball bearing motor with mounting bracket.

PATTER AND BRUMFIELD OVERLOAD RELAYS

$1.95

F236

1, 5000 ohms, coil current 10 Ma., Relay 2, 110V. 60 cy. AC. coil S.P.D.T.

MICA CAPACITATOR

49c

F241

.002 MDF. 3000 VDC.

PANEL LIGHT

F306

29c

Bulls eye with poloroid lense.

POWER TRANSFORMER

Test 4000V. Pri. 115V. 60 cy. 1400V. ct. or 1200V. ct. at .260 amps DC.

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5 GANG VARIABLE CONDENSER

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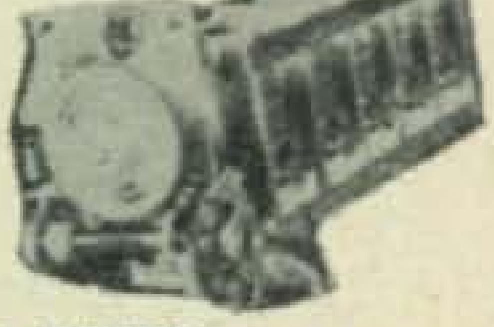
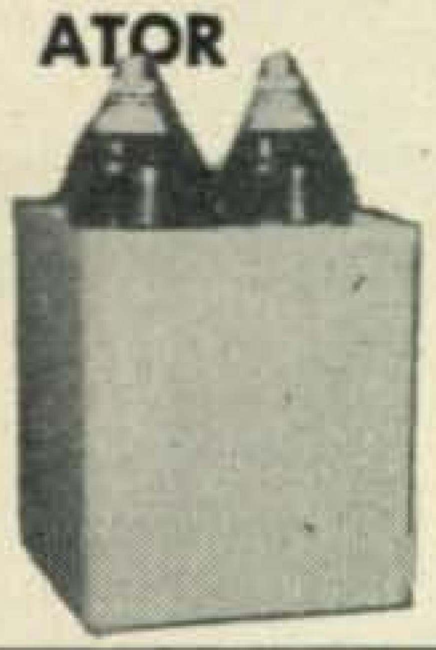
F-243



Approx. 50 MMFD. per section with individual air tunnel padders . . . 18 to 1 vernier drive.

GENERAL ELECTRIC PYRANOL CAPACITATOR



$2.95

F229

1 MFD. 5000 VDC 4" x 4½" x 3¾".

$1.29 MALLORY

F309

2000 MFD 50V.

95c MALLORY

F308

(W.P.) 2000 MMFD at 15V.

AIRCRAFT POWER RHEOSTATS

25W 25 ohms 1 amp. max. **69c** *F282*

50W 30 ohms 1.7 amps max.

95c

F283

SMOOTHING CHOKE

$3.95

F304

10 Hy. 350 mil.

IDEAL FILIMENT TRANSFORMER 110V-60cy. 220V at 50 ma. 6.3V at 1 amp. 6.3V at 2 amps. 5V at 6.5 amps. 6 x 4½ x 5". Shipping wt. 11 lbs. F271 .... $1.29

PYRANOL CAPACITATOR G. E. 1 MFD. 5000 VDC 4 x 4½ x 3¾" F 229 .... $2.95

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No. 18 COPPERWELD WIRE 3000 feet F240 .... $2.95

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Europeans hearing the East Coast lads calling the Midwest. W2AMJ worked: G5BY, BM, G6ZT, W9HGE, ZHB, ALU, JMS, NVY, JVE, all from 0820-1128 EST. W1NF heard only W9UED at 1110 EST. G5BY hooked: W1CJL, SZ, IN, KUD EHT, DJ, CJL, W2AMJ, W3OR, VE1QZ, WØNFM; and heard W1HDQ and W8MVG. W9ZHL got on Es: W1DEO, LSN, CHY, MUX, PZG, W2LAL, OUS, NPG, IDZ, W3BKB, OR, from 0930-1018 CST. W7QLZ MUF'd to 40.2 mc. W2-IDZ heard G5BY and G5BM, then worked on Es W9ZHB, ZHL, WØKYF. W3OR and W3RE hooked WØZJB.

Dec. 1: W2AMJ still at it got: G5BY at 0919 EST. G5BY had QSOs with VE1QZ and W2AMJ from 0834-0920 EST signals fair. W7QLZ grunted and got the MUF to 46.1 mc.

Dec. 7: W2RLV got W5AJG on Es at 1150 EST. W5AJG worked W8WSE, QYD, NQD, SFG, W2RLV, from 1027-155 CST. W4HVV, W4WMI, WØWOW/4, all worked WØZJB during the same Es opening.

Dec. 8: G5BY heard U. S. A. FM stations to 49 mc; no amateur signals coming through.

Dec. 9: Again G5BY heard FM stations to 49 mc.

Dec. 14: W7ACS/KH6 hooked between 0911-1032 HST: W6-QFT, GGM, BWG, AMD, ANN, NAW, OB, UXN, W7ERA, FFE, with excellent condx. W5ELL heard W7ACS/KH6 come back and many times afterwards, but no contact was made. W7BQX worked W4IUJ and W4EID from 1025-1125 PST with poor condx. G5BY again heard U. S. A. FM stations to 49 mc. W2BYM worked W6QG, OB, ANN and heard W6-NAW, saying he had his beam more on them than normally, which is N.W.

Dec. 15: W9ZHL had an Es opening getting W4IUJ, W5FSC, KIV, JLY, from 1850-1932 CST, with fair signals.

Dec. 18: G5BY worked W8MVG and heard W8CMS for the first break through since Dec. 1st.

Dec. 20: W5WX worked: W9THL, W9ZHL, W9JMS around 2125 CST.

Dec. 21: W5JLY worked WØZJB at 2159 CST, very fragmentarily!! Es made its appearance in VK-ZL land when ZL1HY, ZL4BN and ZL3AR worked all VK districts except VK6-9. ZL4BN worked 22 VKs during the opening.

Dec. 23: W8ZVY and WØZJB contacted on c.w. fragmentarily, at 1825 CST.

50-mc Openings

It's been a long time since we have heard from the gang on 50 mc, and their comments.

Ernie Grant, W1GJZ in Greenwood, R. I., says his biggest kick came when he worked HB8VK in Zurich, Switzerland, just under 50 mc. A commercial harmonic came on HB8VK just after signing which would have taken him out during the QSO.

A. D. Adams, W4FNR, in West Palm Beach, Fla., sends us the letter he has "dreamed" of writing for a long time, for on Oct. 19 he worked OA4BG and OA4AE at 1741 EST. Ab heard the OA4s in local contact and hurriedly turned the rig on to raise 'em before the fade out. This left Ab limp and happy with 25 states, 8 districts, VE3, OA4. The rig at W4FNR is PP HK24s with 90 watts to a 4-element beam. The receiving end is a CML broadband converter into a HQ-129X.

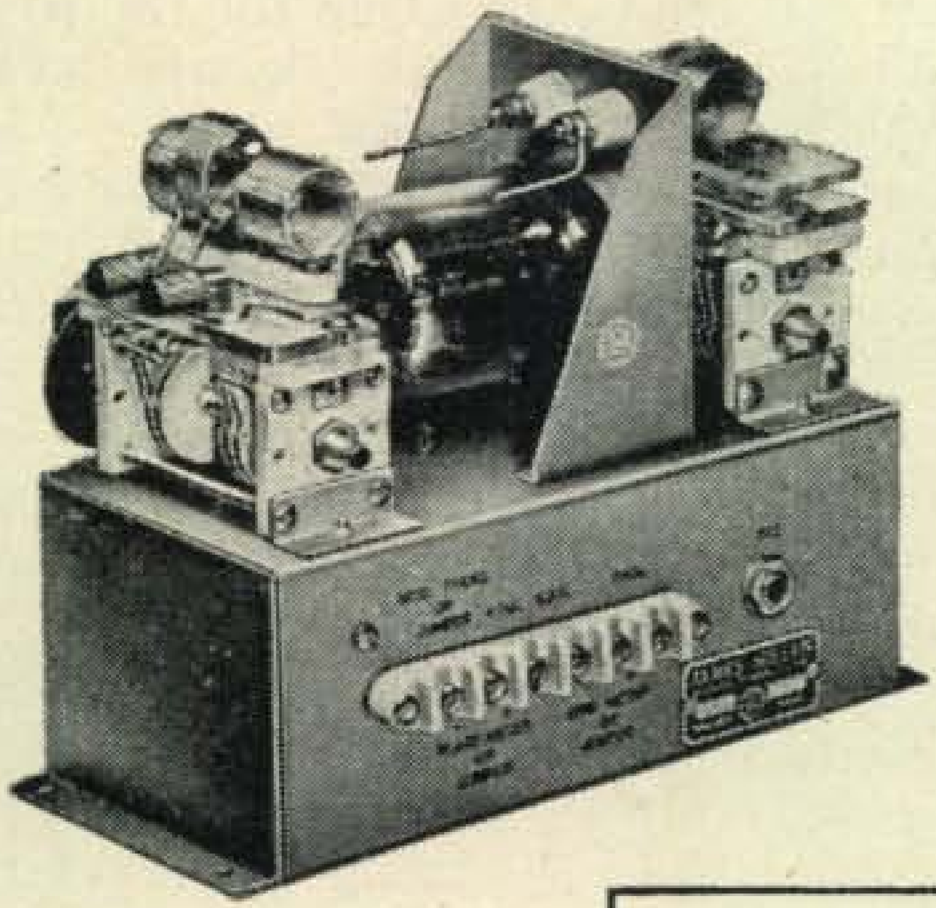
A fine list of East Coast stations received has been sent to us by Elmer R. Walker an ardent v-h-f listener, of Alderwood Manor, Washington, near Seattle. Elmer whiles away his bedfast hours by listening on v-h-f. and, if it opens, alerts the Seattle gang. Elmer hopes to join the 50-mc gang with a ticket soon. Good luck Elmer, hope it's not too far away.

WØQIN says luck is against him, for on Nov. 24 he was on the band until 1045 CST and worked nothing. But WØTOZ in St. Paul worked G5BY from 1150 to 1205 EST, just after Bob closed down.

On Dec. 14 at 1230 MST, W7ACS/KH6 came back to what must have been W5ELL's, 1000th CQ. Unfortunately the QSO wasn't satisfactory as a power leak came up and took him out. It was a real surprise for Ed, W5ELL, for he was tired, sleepy and had a bad headache from listening to car QRM for the past two days.

W7DYD says that with all the DX taking place on 6 meters the local activity has increased with W7FIM, FP, GXP, JFS, ACB, KLB, AWP as new additions, and the old hands still plenty active with W7DMN, BQX, DF, EUI, EVO, and W7DYD.

HARVEY *FOR EQUIPMENT*

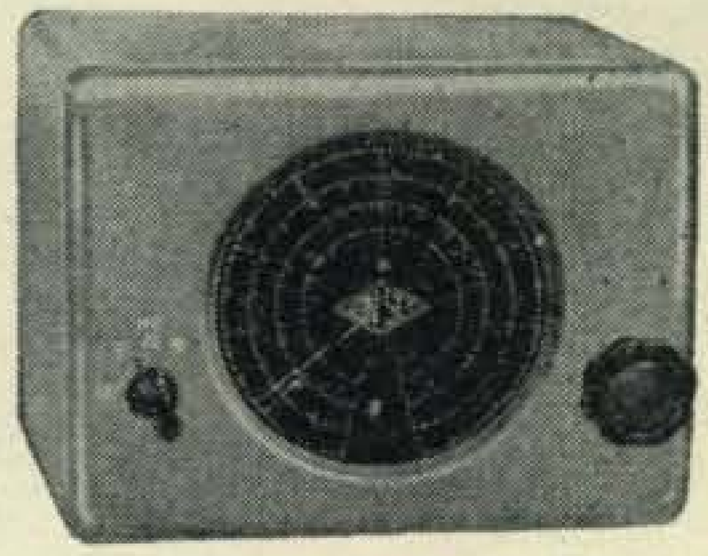


90811 MILLEN RF AMPLIFIER

The 90811 RF Amplifier provides 75 watt output on all bands 2-6-10-15 and 20 meters. It is identical with the final amplifier used in the Millen 90810 High Frequency Transmitter. The 90811 uses an 829 B tube and can be driven with as little as 1½ to 2 watts. The 90811 comes equipped with 10 meter grid and plate coils. Coils for other bands are available. This unit makes an ideal final for the ham who wants to go on 6-10 or 20 meters with 75 or 100 watts. It is also an ideal power amplifier for mobile installations.

90811 with 10 meter coils (but less tube) net price **$33.00**
48021 20 meter grid coil.............................. **1.80**
48121 20 meter plate coil............................. **1.80**

Coils also available for 2 and 6 meters at **$3.60** per set



GON-SET 6-15 CONVERTER

6-10-11-15 meter bands in one converter without changing coils! 8 tubes, actually 3 separate converters in one, with selector switch, large bandspread dial, output frequency 7 mc. Built-in power supply. Complete, net price....**$75.00**

HARVEY'S HITS OF THE MONTH

Harvey has 20 meter crystals for a buck! Mounted in holder with ½" pin spacing. Also 40 and 80 meter and 6 and 13 mc. bands at the same low price..**$1.00**
Special 8 mc. xtals for 2 meter xtal control, only...............**$1.50**

Also in stock complete line of Bliley AX-2 xtals
Include 10¢ postage with your crystal order

HARVEY'S HAMFESTIVAL OF VALUES

SINGLE BUTTON CARBON MIKE

in telephone type stand, with tiltable head, press-to-talk switch, 6 ft. 3-wire cable and PL-68 plug....**$4.95**

1616 TUBE

Half wave, high vacuum rectifier. Filament 2.5 volts, 5 amps; peak inverse 5500 volts; peak current .8 amps; surge current 2.5 amps; average plate current .130 amps. List price $7.50, Harvey special price, **while they last** ....**95¢**

Harvey-Wells TBS-50 Rated 50 watts using an 807 in final amplifier. All bands from 2 meters thru 80. Has self-contained push-pull 6L6 modulator stage. Complete with tubes, meter and built-in band switching coils, in very attractive hammertone finish cabinet. Just the thing for mobile or low-power fixed operation.
Less power supply...**$99.50**

National NC 183 IN STOCK! The new and beautiful NC 183; 2 stages RF, exceptionally high image rejection; uses a stabilized voltage regulated circuit; push-pull audio output and latest type crystal filter; NFM adapter available. Frequency range 540 kc to 31 mc, continuous, plus 6 meter band. Complete with tubes. speaker and built-in power supply...................**$269.00**
NFM Adapter.. **16.95**

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On Oct. 31 Herb, W7DYD, heard the second harmonic of WWV on 50 mc, from 25 mc. He also heard W2RLV in Western N. Y., mighty close in for F2 transmission. The reception of W7DF in Everett, Wash., by ZS6GX on 50 mc, Nov. 3 at 1003 PST has been confirmed, and is the talk of the local gang.

Bill Reilly at W2RLV says local activity has picked up with W2FBA and W2NNT now on. Best DX for Bill was HB8VK on c.w. Nov. 27. The 27th also gave Bill his second with KL7DY, on a new frequency of 50,250 kc.

W9ZHL, Terre Haute, Ind., says that for the past few weeks in mid-November weak signals have been coming through for just a few words, and wonders if the comet in the South has anything to do with these signals breaking in. He also adds that all the DX being worked on 6-meters sounds like the 30s.

Bish, W7HEA, says his ole model A is just about all tuckered out from racing back and forth to the shack and work, every time the MUF hits a peak. Bish has been hearing plenty—from the XYL, and 6-meters!

"Why won't 6 meters come into Butte, Montana, these days," says W7KKB. The only signal to make it was VE1QZ on Nov. 3, at 1050 MST, with bad QSB and only an S4 signal. Well, Tom, you are in the same kettle as W7QLZ, just too close, for the 1st hop appears to be between 2500-2700 miles. We know how you feel chum, but just wait until summer's Es!

We regret the mistake of giving the 2-meter record to WØNFM-W2TTW/2, for when the complete story was known, W2TTW/2 was north of Jamestown, N. Y., and not east as was originally thought. Therefore, we join the others in giving the record to WØWGZ in Grinnel, Ia., and W3GV in Erie, Pa., a distance of 670 miles. Congrats to all concerned. including WØNFM-W2TTW/2 whose contact was just 23 miles short of 670.

With this issue we hope to start the 144-mc Honor-Roll, so that all of you may see who is leading and where *you* stand in the list.

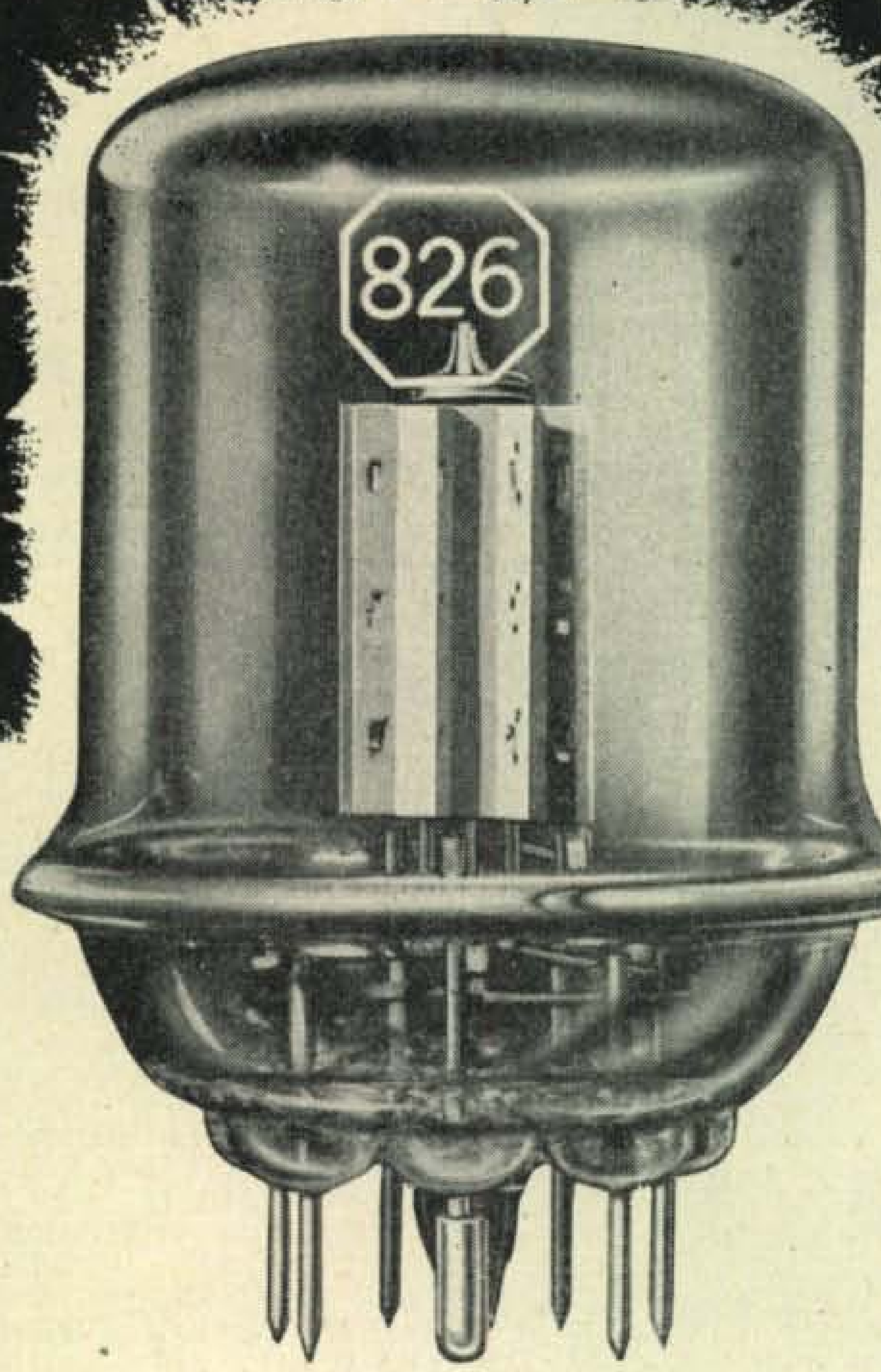
144-MC HONOR ROLL

Calls	States	Districts	Others
W9ZHB	9	6	
W9LWE	8	5	
W9IPO	8	5	
W9BBU	8	5	
W8QKI	7	4	VE3
W8RUE	5	3	VE3

Bill Dehart, W9LWE, in Chicago has worked: Ill., Ind., Wisc., Ia., Mich., Ohio. Pa., and N. Y., using 525 watts to a pair of HK257Bs on 144.25 mc. The antennas include a 4-element H, horizontal; a 5-element vertical and a Unipole vertical. For receiving, a VHF-152A and SX-28A is used. Thanks, Bill, for the info.

Herb Johnson, W3QKI, managed to work five W9s on Oct. 13, along with numerous W8s. Indicated signal strengths show the W9s at 400-475 miles were from 6-30 db above the noise level. After the band settled down Herb had an hour's QSO with W9BBU at 430 miles, his signal averaging 25-30 db above the noise. The score at W3QKI is 121 different 2-meter stations in 7 states, 4 districts and VE3.

From an A.T.&T. Co. Engineering Bulletin, we find that on Nov. 9 a New York Telephone Maritime Mobile Service operator heard amateur radio



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Filament amps.	4
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Max. plate current	125 m.a.
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Power Output	Watts
Class C amp.	86
Class C plate mod.	53
Class B telephony	22
Grid modulated	25

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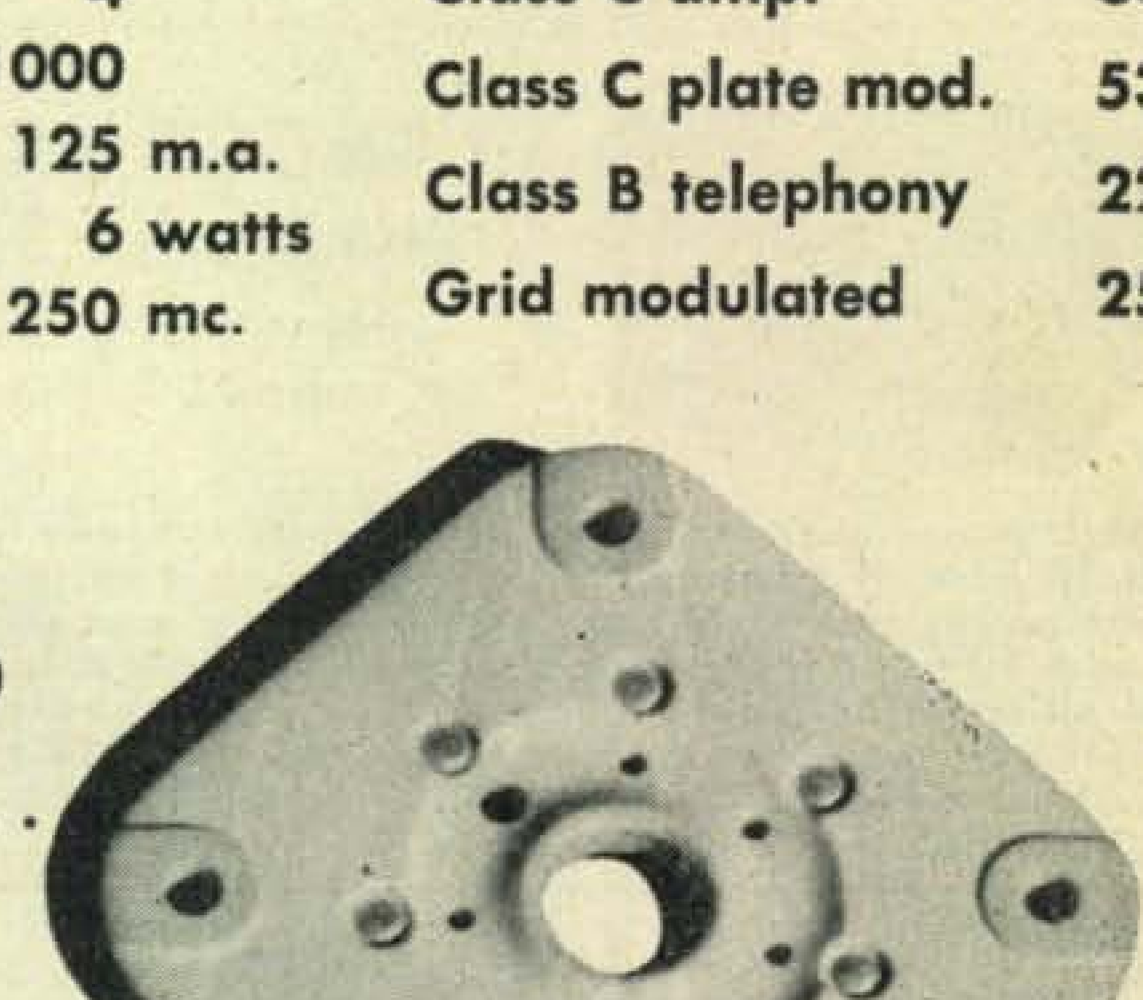
Ceramic tube sockets for 826, 829B and 832 tubes . . . only 50c each.



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VP9T in Bermuda, calling CQ for about a minute, at 1437 EST on 157.17 mc, a distance of 800 miles. Well VP9s what are you waiting for???

VE3BAX has worked W2-3-8 using an SCR-522 into a 6-element rotary and a VHF-152 into an SX-25.

Clair Brown, WØNFM, in Solon, Ia., says that with all the super-refraction taking place on 144 mc, that before long taxi drivers around the country will be holding the v-h-f record.

144-mc Reports

W3GV, in Erie., Pa. says that the 100-mc FM band is monitored to check conditions for 144 mc. At 1530 EST, Oct. 13 he heard about 100 FM stations, the loudest of which were in the Chicago area, at 400 miles. Getting on 2 and alerting the boys locally, upon standing by, W9WN on vertical was calling an S4. From then on it was a bedlam with stations coming in until 0300 the 14th. The following were worked up to 450 miles: W9WN, WOK, LJV, LWE, BBU, BHV, IPO, W8BTL, TBS, NZ, SBR, TIH, ZSM, UKS, UZD, and VE3BHE, VE3BVY. Most stations were S9. While in contact with W9BBU he switched to 75-meter phone, but the signal on 2 meters was clearer and louder.

Oct. 14 no W9s were heard although all W8s up to 350 miles were very loud, many at a great distance being as loud as a local, running 20 db over S9.

Oct. 15 signals up to 200 miles were heard early in the evening, but settled down to the regular 150-mile range late n the evening. The 16th showed just regular QSOs.

On Oct. 13-14 microwave relay stations in Ontario had some high signal strengths between themselves at 50 miles on 2400 mc, when the 144-mc band was good.

Bill Smith, W3GKP, in Silver Spring, Md., says that 144 mc exhibited some extraordinary conditions for several nights starting Oct. 3. W3EW in Berwyn, Pa., was worked along with W3BLF, and W3NP. On the evening of 4 and 5 Bill hooked W3CGV in Del., W2EH, W2PAU, W3DQZ, W2YT. Oct. 5-6 W3GKP started out with W1SF, W4CYW, W1BCN, W2AOD, W2AXA, W3ASD, W2BPV, W2JBM, W2OTA, W3EQZ, W2OGV—seven states in one night! Oct. 6-7 was good for W2IL, W1MNF, W3ISE, W3FGN, W3BCI, W2EH, W2AES, W3FGQ, W3DQZ, W3ASD, W3ER, while on the evening of the 7th W3BYO, W2LKN, W2FQW, W2PCV, W3DZD, W3CGV, W3DQZ and W3DGS were landed. This night gave Bill, W3GKP, 21 new contacts and pushed his best DX out to Cape Cod—more DX in concentrated form since Sept 8, 1946, when 28 stations over 100 miles away were worked. Bill now has a new tower 48′ high, which consists of several arrays of W8JKs stacked. All the above DX was worked with the new array.

W2NCZ in Ocean Grove, N. J., gives us a few lines about the T-9 Society Radio Club of Ocean Grove on 144 mc. There are five members, namely: W2OFM, W2KXK, W2HXO, W2BYK and W2NZC. The club is small but all have xtal rigs on for emergency relays.

Here's some real DX. XE1KE in Mexico is now going out after the 144-mc DX record. The rig will be a 522 with an 829 final, and the antenna a stacked array up 90′. For receiving, BJ will use a hopped up ARR-5 with a good grounded grid r-f stage ahead.

Also, we hear via W6WTJ that J9AAO wants activity in the Islands on 144 mc, as some radar signal have been bounced off some rather long distance stuff, which could include good conditions on 144 mc, cause that's ducting again.

420-mc Gang

Still nothing on 235 mc, although VE1QZ hopes to be on this coming summer for DX tries.

VE3BBG has a BC645 and is busy getting it on 420 mc. Some nice antennas are also planned.

Harry Miller, W9AB, in Mishawaka, Ind., says there is some interest and building going on for 420. Harry has a converter half done, and an oscillator using a 15E ready to go when a filament transformer is wound. W9CQH has an ex-radar set with a 3D22 which will put out 50 watts, and the companion receiver about ready. Contacts are expected very soon.

UHF

W6IFE is at it again and now has worked 150.7 miles on 3370 and 3340 mc, from Grants Park at 5000′ to Mt. Hamilton. Signals were very excellent and we hope to give you the full story in an article at a later date.

SK

Don't forget the reporting forms we have for you—just drop us a card. When using the forms, be sure to specify whether the time is GMT, CST, etc., also give your Honor Roll score. In order to include the countries worked, in the Honor Roll, we are going to cut the Districts, but an asterisk will be placed after each station that has WACA, so give your districts with your reports. Thanks for all the co-operation, fellows.

PARTS AND PRODUCTS

(from page 56)

to factory-built blocks and equally substantial can be quickly and inexpensively produced. Kit No. 200 contains molded sections, terminals and screw assemblies, and Kit No. 201 has a balanced supply of end brackets, partitions, threaded rods, screws, nuts and washers. Thus, with the correct ratio of these kits, all sizes of blocks may be built. Complete information may be had by obtaining Bulletin DS-118 from the Terminal Sales Office of Curtis Development & Mfg. Co., 1 N. Crawford Ave., Chicago 24, Ill.

YLs FREQUENCY

(from page 58)

in April, 1939, and my first QSO was using a Hartley oscillator, which I used until the war.

"When we were allowed to operate our stations again I did not know what to do, for the technical demands were difficult for me, a mother of two children, so I decided I would have to give up my hobby. But after only a few months I found I could not forego my QSOs so started a new course to brush up on c.w. and theory. After ten weeks I was ready to take the exam again, and now I am working on 80,40, and 10. For the past year we have had a daily sked with my brother-in-law, SM5VK. (SM3MW is also a relative of ours, so you see we are four ham relatives—hi!)

"Our station here runs 60 watts input, plate modulation, and I'm using an 807 as a buffer with a T40 in the p. a. stage. Our crystal mike was made by my husband. On 20 we have a counterfed antenna and on 10 I use an extended lazy-H to contact the Ws.

"Before the war there were three of us YLs in Sweden, but at present I am the only one, though soon there should be more. Of course, I would very much like to contact a Swedish YL, especially since I never have had the luck to contact any YL station."

(Say, where are all those YL DXers?)

DX

(from page 51)

QTHs

CR4AX	Box 61, Paiia, Cape Verde Islands
HK3CK	Box 584, Bogota, Columbia
I6ZJ	Box 247, Asmara, Eritrea
J8AAW	11 Signal Service, APO 235, San Francisco, California
KB6AD	K. G. Neifert, c/o C.A.A., Canton Island, South Pacific
KX6AF	c/o A.A.C.S., Navy 824, San Francisco, California
PJ1C	c/o KLM Airlines, Curacao
YU7LK	Hudecek O.—Lojubljana, Povestova Nr. 1
ZD3B	Boac—Bathurst, Gambia

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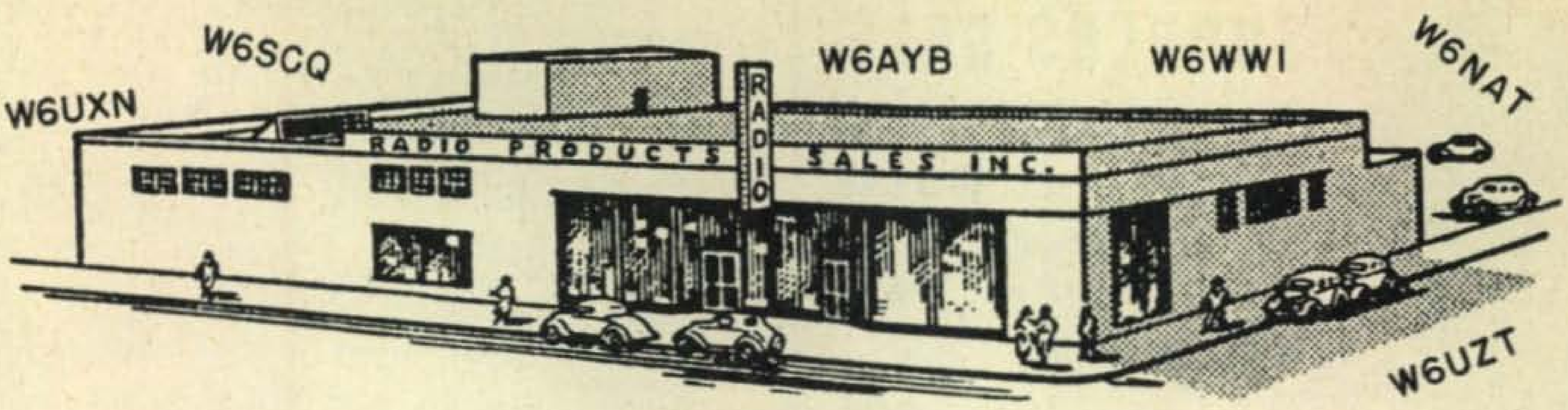
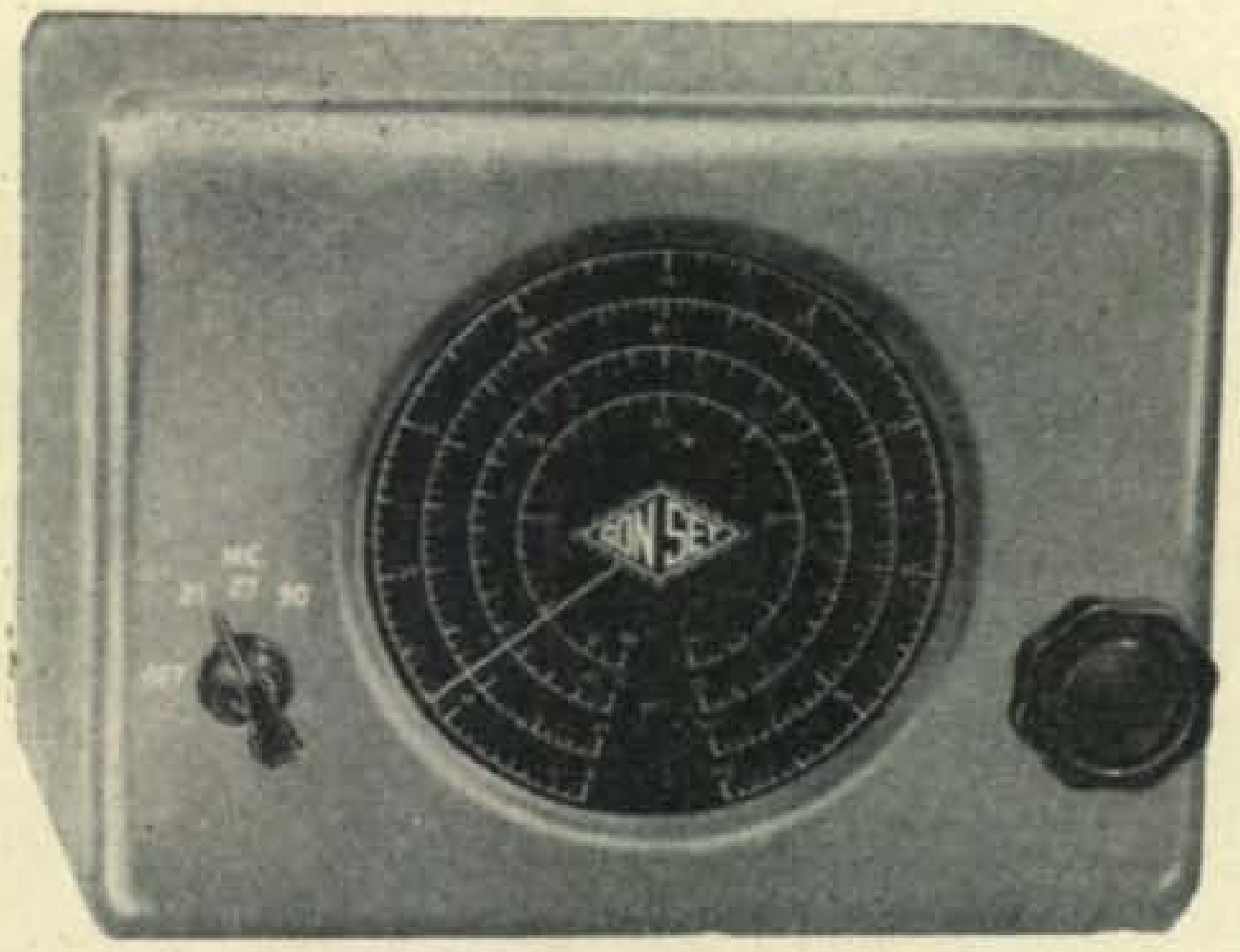
Secretary, P.R.A.R.C.
P. O. Box 73
Hato Rey, Puerto Rico

(Continued on page 84)



ANOTHER *FIRST!*



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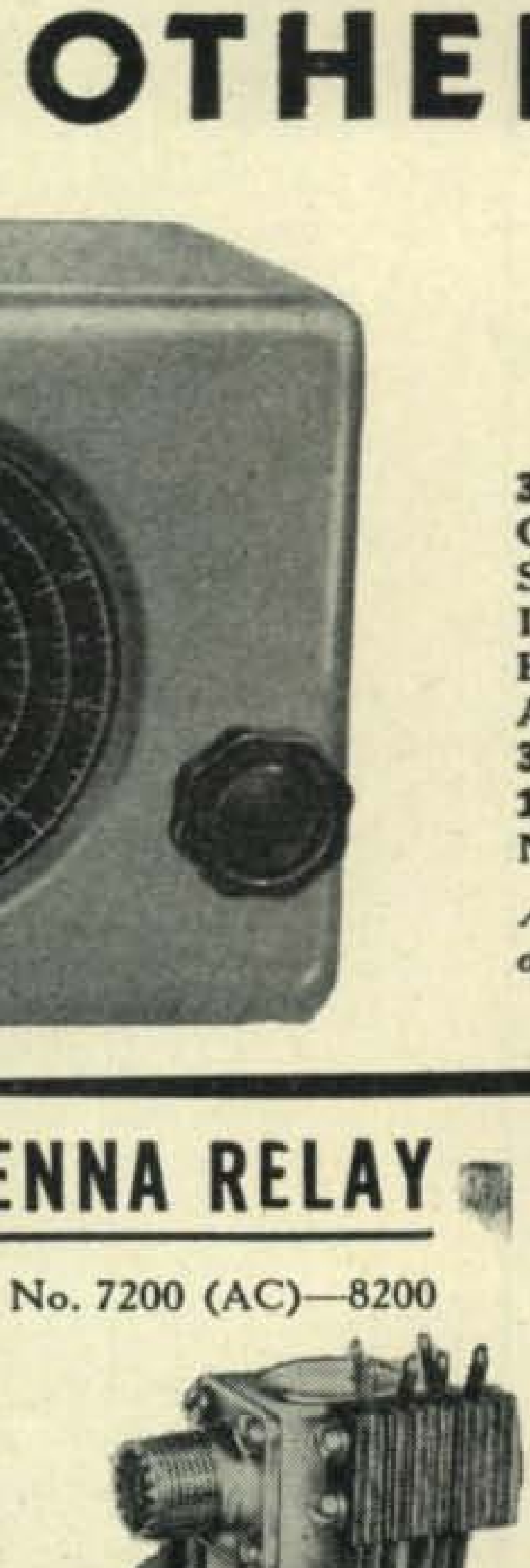

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6H6 (NEW)..........	.30	6AK5 (NEW)........	.69
2X2A/879 (NEW)....	.69		

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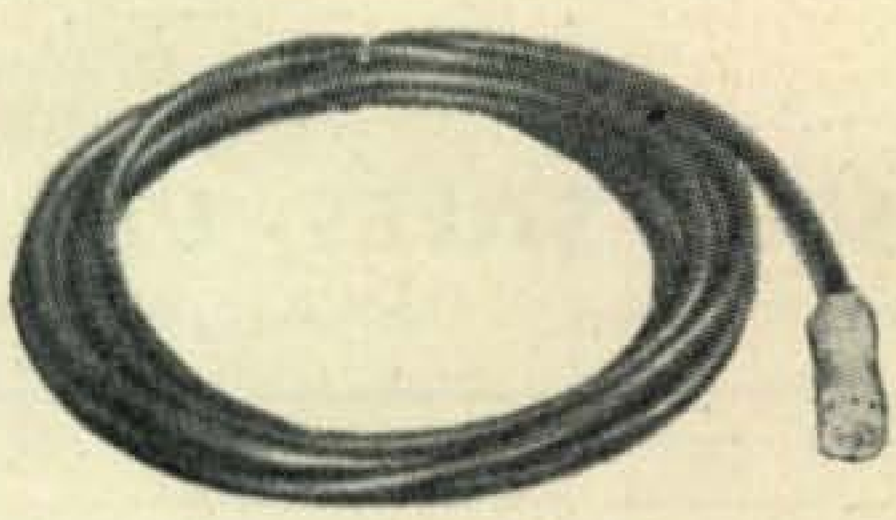

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try. It seems like everybody worked him except, of course, Yours Truly. At least I can read about it. Incidentally, W2BXA, who does his DX with a mike in one hand and a key in the other, has added this same VQ1HJP, but this still isn't enough to boost him to the top of the Honor Roll. W6VFR noses out W8HGW with his 182 countries, while 8HGW has 181C, and W2BXA and W6PFD are tied with 176C. Boy, those country totals are really something, and if you added all the countries together, as represented in the Honor Roll, think of what a lot of real estate that would represent.

W6ANN says he heard 6LEE on six meters. Is that good? W6AX got on 40 meters for a couple of nights and was surprised when he worked *SM5JV*, *G5LI*, *G5GK*, *F8EO*, and *KM6AA*. Phil Bates (no call letters given) shoots us the following information. *CT2SM* is a new one on in the Azores, but on a different island (Santa Maria?) than *CT2-AB*. G2CDI is now *VP6CDI*. *VO1O* operated at 14,160 phone with 30-watts input, and is usually on about 0330 GMT. VO2T is W5FSP and VO2X is W1EBT.

W6UCX says there is a new station on Canton Island, *KB6AD*. KB6AD says his station will be in the top of a flight control tower, 80 feet in the air, and the antenna about 15 feet above this. He has another antenna on some 65-foot poles, and this antenna happens to point to the States. He says he probably is the only ham to have his shack above his antenna with his feed line running down instead of up.

KL7NA is located on Adak Island in the Aleutions, and they have an active ham club there. The president of the Adak Amateur Radio Club is W7ELJ, and the secretary is KL7LO. He says the Japanese stations with their BC-610s give them quite a bit of QRM. *KL7NA* who incidentally, is ex-W8LYZ and W7JMV, runs 300 watts into an 812H, when on c.w., and 200 watts for phone. The antenna on 20 is a V beam 8 wavelengths per leg.

In looking at the bulletin of the Rochester DX Association sent me by W2PYW, I see that it lists W2QCP as high man with 37Z and 112C for c.w.-phone, and the high man in the club for phone only is W2RTX with 35Z and 107C; this was all done

on 28-mc. phone. I don't believe we have received any Zone or Country Lists from them, however.

VE1EP says he will be in the DX Marathon signing VO6EP. He expects to be operating in Zone 2 for the next two years. Well, I have been on the air just about two years since the war, and I haven't Zone 2, so maybe these next two years will produce this VO6EP for me. Given time, I guess you can do almost anything.

In a letter from W2BJ, he tells about putting up one of W8LO's antennas and claims it really does the job. W2BJ said a bunch of the oldtimers got together recently at a meeting, and, to attend, it was necessary to have been a ham for 25 years or more. Thirty-eight showed up, and they elected W2FX president. They call the club "Q.C.W.A.", or "Quarter Century Wireless Amateurs." If any of you gray-beards want to join, get in touch with W2FX. Who, me??? W2BJ goes on to say that W8BHW, who, of course, is ex-W2BHW, married a gal from California. Well, natch! We have plenty of marrying gals out here.

Now, W2IOP . . . 'taint important . . . forget it. But, another W2, this one being W2PNB has been running 45 watts into an 815 and has worked a slug of DX on 80-meter c.w., The DX he has worked on 80-meter c.w. fits into 9 zones and 18 countries.

VS7DR sends word through W3LMA that he wants the gang to know he is having a tough time trying to get his QSL cards, but when he does, he will see to it that everyone receives his. Yes, stupid . . . everyone he has worked will receive a card. He expects to go to China sometime in February, and as soon as he gets a license there, he will be on the air.

W6VFR tells me that a former TF S.W.L. now has a call, *TF3AB*, and is now on the air. And, that *VR4AA* is back on 14,130 with a chirpy signal and can usually be found in the evenings. VFR said he wasted a lot of Kwh calling *ZD1BD* only to find he tunes from the low end. (That's why I keep telling you, "See you on the low end.") *UA-3AM* told VFR that he had 37Z and 106C; that there are no UM8's on the air; and there is only one UF6, and he is only on 7 mc with QRP. Marv will probably get him to swing down to 14 mc before he gives up.

WØAZT took time out from selling stuff and worked a little DX for a change, adding three zones and 19 countries. Those WØs, YXO, NUC, NTA, and GHS—are still going after the stuff with all the enthusiasm they can muster. They all have 39 zones, and their countries show up in the same sequence, something like this; 157, 150, 140, and 139. They all seem to be on the air at the same time. For example, the other day *HS1SS* broke thorugh, which is very rare for that neck of the woods, and YXO worked him for his first WØ. He was followed by NTA, then GKS, and fourth was NUC. Well, let's see what happens in the battle of the Zeros next month.

W6LRU wants to get some dope on *PK6AC*, *D6AC*, and *D7AA*. By the way, LRU worked one of the Isle of Man, 10 meter c.w., *GD3BBS*. W8PCS says that W8AVB added 20 new countries after he started using his new 3-element rotary. W8HSW has had his DXing slowed down due to a new junior op. in the family. W8PNY bought a 5-acre antenna farm, which makes it look like he is really out after them. W8BIQ, the 10-meter phone man, is still finding new ones to work. W8VLK added five new zones and nine countries last month. Not bad.

We're sorry we listed W7HTB in the c.w.-phone section. He is where he belongs now—phone only,

although he does admit that he knows the code, too. Sure, we can make mistakes with the best of them. As a matter of fact, sometimes it surprises me that any of you fellows are listed with the proper number of zones and countries. After wading through the Zone and Country Lists every month, with the committee working feverishly to meet the deadline, I am amazed that it is as accurate as it seems to be.

W6ITA says he never has time to get on the air any more, but, somehow, he found three new ones for a total of 172C. Yep, he is W.A.Z., too.

Then, of course, there's always W2IOP, who . . . er, ah . . . no, better not. W2SGK wants the dope on XT9F. Anybody get a QSL?

W2HZY has his troubles. He says his count will probably stand at 30 and 140 for a long time due to being put off the air by his landlord. It seems like the poor guy was using a folded dipole in the attic, and when he worked *VQ1HJP*, he probably punched the key too hard, because he blew a fuse. The pay-off was the fuse was the main one, and he put the whole joint, I mean apartment, in the dark. This was more than the landlord could take (he blew a fuse, too) and now W2HZY is in the dark. He was running 700 watts into a pair of VT-127As. Until he finds a new QTH, or a new landlord, he will be doing his DXing from W2JC, the Bloomfield Radio Club.

W2PEO says that VQ3HJP was on the air in Zanzibar as *VQ1HJP* December 1-4. He was there for the purpose os installing an 80-mc radiotelephone link from Zanzibar to Tanganyika. He had about 120 QSOs and very little sleep. He will QSL all contacts made while there as soon as his special cards are printed.

W6WKU received five cards from *C8YR*—one for himself, and one each for W6VFR, W6MJB, W6RDR, and W6QD. The sad part of it is that this card didn't give W.A.Z. to anyone. VFR and MJB already are W.A.Z.; RDR needs a card from *VQ8-AD;* WKU needs one from Zone 17, and QD needs . . . oh, shucks, plenty of them.

ON4JW says all the prewar amateurs in Belgium have been asked by the GPO to take new examinations for renewal of their licenses in 1948. Incidentally, ON4JW worked his 39th zone when he hooked up with *XZ2HP*. *VK4RC* is a new one in the Honor Roll, and he said, some time ago, he worked *VU2BX* who told him he was on the Bhutan border. Now he is wondering which side of the border VU2BX is actually on, since Bhutan, of course, is a separate country.

Another new one in the phone section of the Honor Roll is *XE1AC* with 32Z and 100C. He is in Mexico City and runs a kilowatt input to a pair of 4-250As, modulated by a pair of 810s. The antenna is a folded dipole built of 500-ohm open line, although he has a beam now under construction. The receiver is an NC-240D. Speaking of phone, W6DI is still moaning about not being able to get any new ones on phone, and yet, he has picked up a new zone to lead the phone boys with 38Z and 131C.

W3JTC has sent us a very nicely typed list of his zones and countries. I didn't think he actually typed it himself, and his explanation rather bears me out. Larry works for the War Department, and at radio station WAR. As he said, there are a lot of people working there, and they hear him talking a lot about DX. He goes on to say there is one girl in particular who knows nothing about ham radio, but has listened to his DX bragging for so long, she decided to whip out a poem. It seems they were

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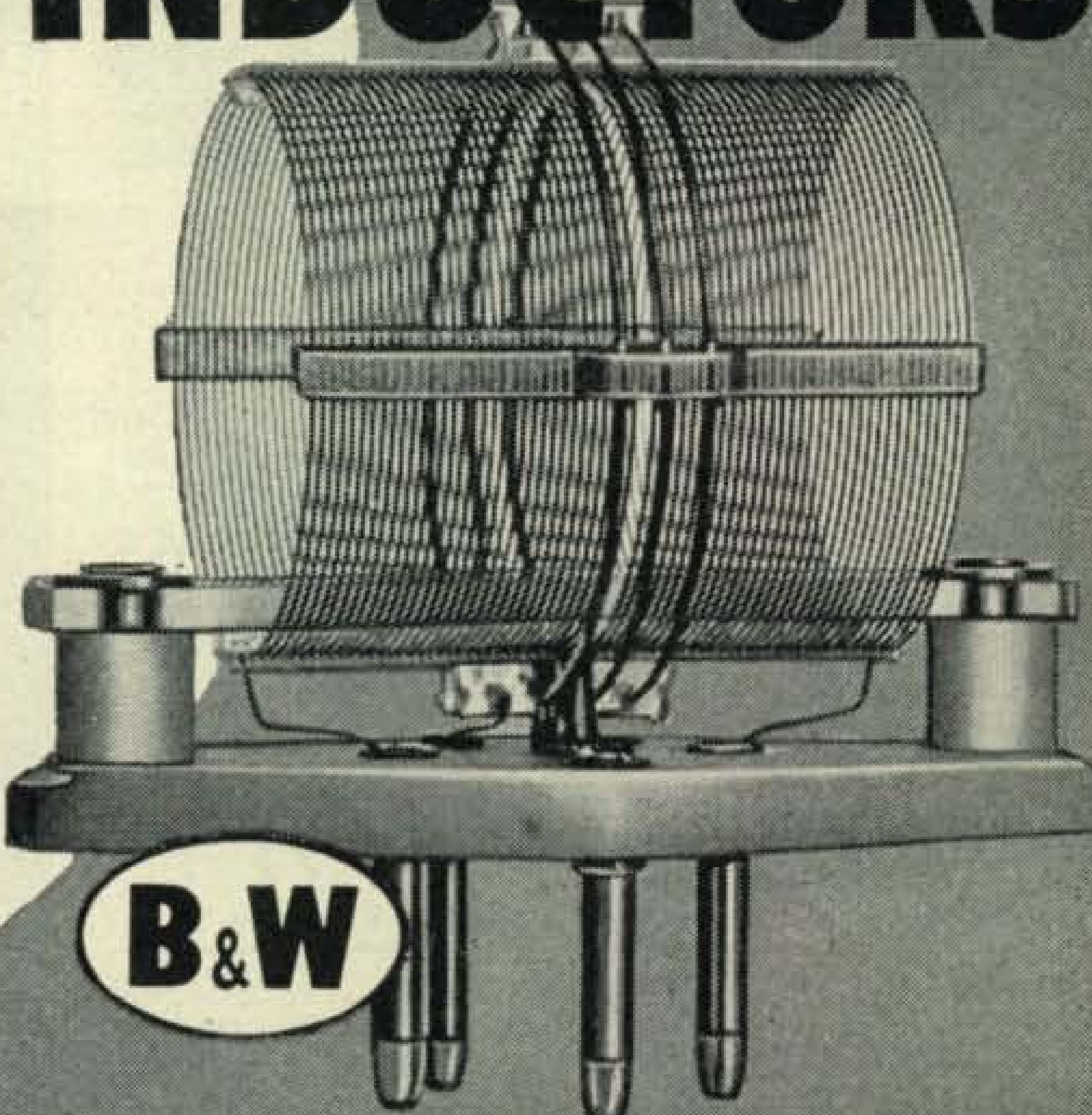

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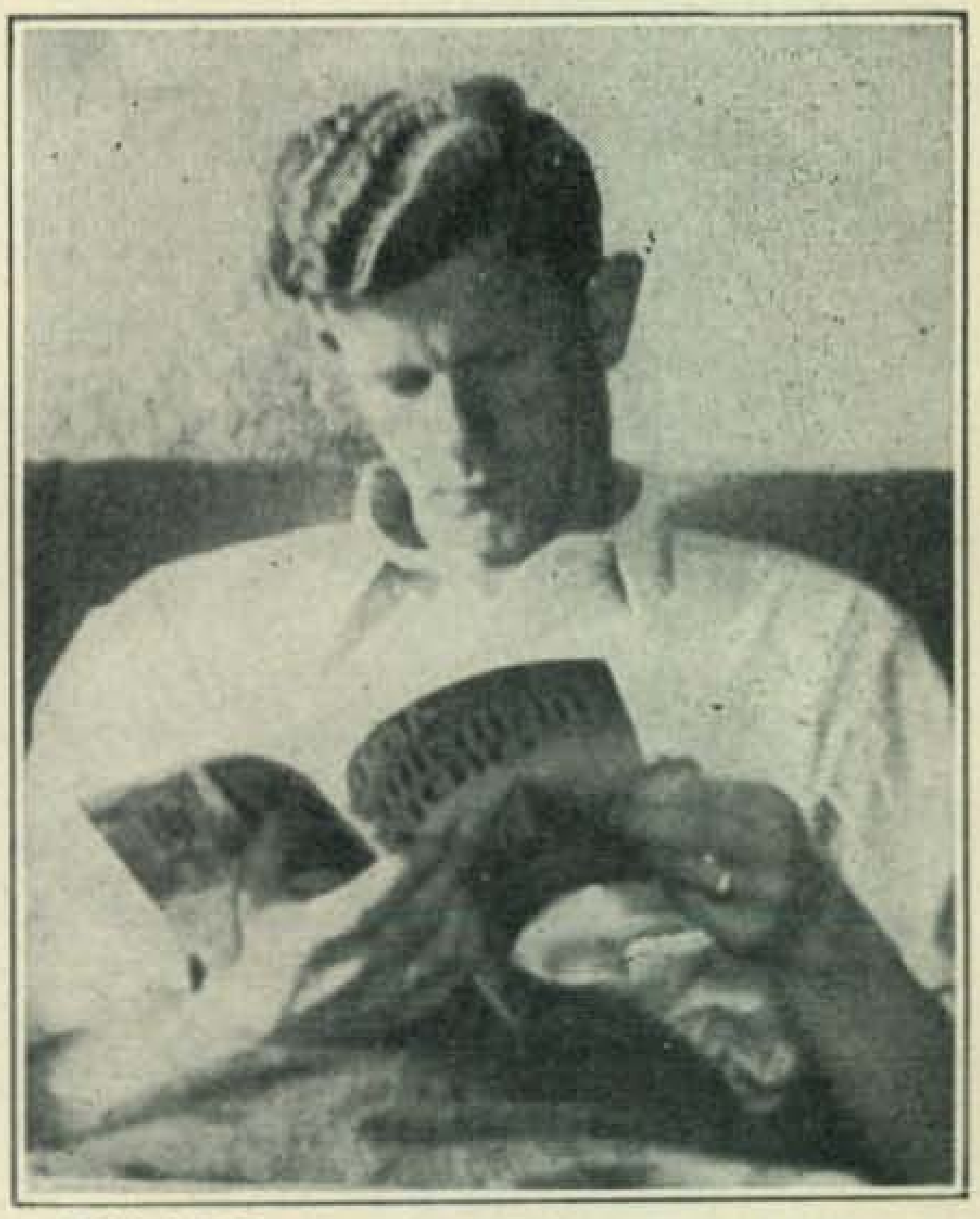
working the midnight shift together when she typed the list, as well as the poem. Sounds to me like that is a pretty good shift.

W.A.Z.

This is the story of C.Q. ham,
Born with an oscillating diaphragm.
He shocked his parents quite a bit,
For his first clear words were, "Da, da, dit."
His ear was sharp, and his eye was keen,
And he cut his teeth on an 813.
They sent him to learn how to read, write, and spell,
But little C.Q. didn't make out so well.
He had built his own station when nine years old,
But English and History left him quite cold.
The years sped by, and so he grew,
And fell in love, as all boys do;
He told her that life without her was bitter,
And he begged for her hand . . . and her brand new transmitter.
The girl said, "Yes", without delay;
So their networks were merged the very next day.
Their happy life more than fulfilled their desires,
And their children were natural-born amplifiers.
One day old C.Q. kissed his spouse
And climbed upon the top of his house,
To examine an aerial he dearly cherished . . .
He fell off the roof and quickly perished.
Now, C.Q.'s wife just had to laugh,
For his will prescribed his epitaph:
"Please carve above my buried bones
These words: "HE WORKED ALL FORTY ZONES."

We think that is a pretty good piece of poetry, how about you? Still more from W3JTC. He recently got a card from *ZC1AL* and, apparently, the "AL" stands for Arab Legion.



OY3IGO, the only OY now operating.

How to Get in Honor Roll

For those who do not have a copy of "CQ DX," or have not seen the rules for entering the W.A.Z. Honor Roll, we are again printing them. To enter the Honor Roll, is it necessary to submit a list of postwar zones and countries worked. Send them directly to: Herb Becker W6QD, 1406 S. Grand Ave., Los Angeles 15, California. In order to facilitate the work of the DX committee, please see that there are actually two separate lists, and it would be appreciated if other DX news was not included on the same pages. A standard form, which will prove of mutual benefit, may be had for the asking simply by writing the Editorial Office of *CQ* in New York.

The Zone List should be numbered from 1 to 40 down the page, and after the Zone number, list the call letters of the station, followed by the date and time of the QSO.

The Country List should be numbered (unless using our standard form), and should be arranged alphabetically by country. These should be followed by the call letters of the station worked, and the date, and time. Your lists will serve as Master Lists in our file, and when additional zones and countries are worked, we would like to have them submitted, using the same sequence and form noted above. These will then be checked and added to your Master List. Sequence in the Honor Roll will be determined by the number of zones worked.

The Honor Roll is divided into two sections. The "c.w.-phone" portion of the Honor Roll is designed to indicate the total amount of DX worked by any station. The "phone" section will contain totals of "phone to phone" contacts only. A word of explanation might be in order on the origin of the Honor Roll. Some ten or eleven years ago, when we started the Honor Roll, it contained totals of the DX worked, and there was no distinction between c.w. and phone. It was originally created to indicate the maximum amount of DX that any one station could work. About a year after its inception, we took a sort of Gallup poll, and it was decided that we would separate the phone-to-phone contacts giving these boys a section of their own. It was also decided to continue the original part of the Honor Roll on the overall c.w.-phone basis for reasons stated above.

To be eligible for a W.A.Z. certificate, it is necessary to submit forty confirmations, one from each zone worked, along with a list for our permanent records. If you have not already been listed in the Honor Roll, a Country List must be supplied. This will allow you to be entered in the Honor Roll. and, of course, eligible for the W.A.Z. award. The DX committee will be the final judges in Honor Roll entrance, as well as for any awards.

HA1KK and QSLing

Cards to *HA1KK* should still go through our New York office as W2IOP is the guy who is doing the honors. As far as cards from HA1KK are concerned we haven't seen any . . . but he sent 2IOP a list or two of the boys he has worked and Larry forwarded these to A.R.R.L. So, if you want country credit and you worked him (HA1KK that is, not W2IOP) you might go after the fellows in West Hartford. But, once again, as far as we know your card should still go through Larry.

HA8S says things are very tough in his country in getting radio gear for the hams. There would be more on the air if more parts could be obtained. He is Lt. Peter Somssich, Budapest 7, Nemetvolgyi-ut 12, Hungary, and asks that any surplus gear we Ws can spare would be appreciated by many HA hams. HA8S says the active stations now

Two well known "3s," TF3EA (left) and FQ3AT/FE

include 4EA, 4RS, 4AB, 4AC, 2Q, 9Q, 8Z and 1KK. At present operating is indercover and they are supposed to be re-examined after January 1, 1948. when the occupying forces should leave.

CT1A will eventually QSL so be patient. W1AZW, 62 Dexter St., Pittsfield, Mass., will take care of sending your card to him. It is a slow job at the moment so just take it easy.

W6QD's activities have really hit a new low, which I didn't think was possible. The last little flurry happened a couple of weeks ago when I raised a VE8, and, of course, I thought he was Zone 2 at long last. In fact, I must have really pushed the key through the desk, as several Ws chimed in on my frequency giving old QD a number of short "congrats." But, you guessed it, it turned out that this VE8 was located in Fort Smith, which is about 100 miles from the Zone 2 border. With the holiday flurry completely taking over at this time, it looks as though I'll continue to be reading about all of your fine endeavors instead of working them myself.

Oh, yes, we started to say something about W2IOP, but the more I think of it, the more I believe we better let the whole matter drop. After all, he is the managing editor of this book, and he might give me an editorial punch in the jaw.

Let's hear from you fellows on the DX Marathon, and as soon as we get a sufficient number of entrants, we will publish the standings in the column. See you next month. 73.

AUTOMATIC KILOWATT

(*from page 38*)

The discriminator tubes for automatic tuning are mounted on a bracket beneath the chassis. The discriminator coupling condenser, *C5* consists of an 8-32 oval head screw on a ceramic standoff to the rear of the chassis behind the B & W tuning condenser. It is spaced roughly 3/4" from the stator plates. The 68-ohm carbon phasing resistor drops from this screw directly to the chassis ground. Since this variable condenser can rotate continuously, no interlock switch is needed.

If the circuit constants shown are used, no adjustment of the automatic tuning is necessary. This unit was placed in operation with no adjustment other than trying several values of phasing resistor. If the sensitivity of the discriminator is insufficient to operate the tuning during normal QSY procedure, the value of this resistor may have to be increased. If too large a resistor is used, excessive grid voltage will wreck the 6C4 tubes, and excessive feedthrough may require final amplifier neutralization. No attempt should be made to prevent hunting with no load on the final, since the high Q causes very sharp phase shifts slightly off resonance. The hunting will stop when the amplifier is loaded, if proper motor speed is used.

When changing bands, normally rotate the tuning condenser to its approximate position by manually operating relays *K1* and *K2*, *Fig. 8*. This precaution may be necessary since the condenser can be rotated out of the discriminator range.

A 1/2" diameter coupling loop in series with one link lead connects to a 0-1/4 r-f ammeter providing an indication of link loading. This meter and the final plate meter will provide sufficient evidence of proper final amplifier tuning and loading.

This transmitter has been in use for the past five months, with some operation on 40 meters but most operation confined to 20-meter phone and c.w. The antenna used is a half-wave Zepp on 40 meters. By selecting a very high L/C ratio, the need of antenna tuning has been eliminated. On 20 meters the antenna is parallel tuned with about 6-$\mu\mu$f capacity across 12 microhenries. A link from this coil connects through a section of RG8U cable to the final tank coupling link. When operating c.w. from 14,000 to 14,200 kc, the final plate loading varies from 800 to 1000 watts. When operating 20-meter phone, the loading is set for nominal plate current in the center of the band and does not vary more than ± 15% from one end to the other. The antenna tuning is never touched for 20-meter operation, thus it is merely necessary to change loading when going from c.w. to phone.

Within the mentioned limitations the transmitter is positively single dial control. This places no restrictions on QSY, and has made DX chasing on 20 a pleasure. Incidentally, v-f-o operation is swishless, and no key down periods for tuning are required.

A NEW TYPE CAPACITOR

(*from page 39*)

Two methods of employing this type of capacitor are shown in *Fig. 2*. It can be seen that any r-f voltage meets a nearly perfect short circuit to ground when looking through this condenser. Schematically it is necessary to compromise on the symbol and the cancellation lines of force are shown in the illustrations for the sake of clarity. Naturally, the usefulness of this type of capacitor depends upon the arrangement of the radio circuit, i.e., the proximity of the leads to one another. However, by careful design and component part arrangement full advantage may be taken of this higher degree of effective bypassing without resorting to series resonant circuits.

1215-MC TRANSCEIVER

(*from page 44*)

with super-regeneration. The sensitivity is very high in this model of the receiver, but at the same time we have not been troubled with dead spots and the receiver pulling in and out of oscillation. This indicates that a very good match exists between the receiver probe and the 30-inch dish.

It will be found that when using this type of cavity for a dual purpose the transmitting frequency will be slightly higher than the receiver frequency due to the higher impressed voltage. Therefore, if this is used consistently as a transceiver it is necessary to retune the cavity on each transmission. Naturally, this is a serious disadvantage and separate cavities should be used whenever possible. For maximum signal the size of the coupling loop should be somewhat greater on RECEIVE than on TRANSMIT. This is another factor in the favor of separate transmitter and receiver cavities.

For the best results at 1215 mc, the antenna must be mounted in the clear; not necessarily high, but above all closely surrounding objects. Signals at this frequency can be pushed through trees and buildings for short distances, but the signal attenuation is terrifically high. This applies after a fashion to 6 and 2 meters, but at the ultra-high frequencies the shadow effect is quite pronounced. On the other hand, with the proper weather conditions it should be possible to transmit and receive over several hundred miles along the coastline by taking advantage of duct formation[2] in the lower atmosphere. In general watch for duct formation during the cool evenings and nights after very hot days. Good ducts are most generally formed over water.

The writer wishes to thank those whose advice and encouragment lead to the development and operation of our 1215-mc transceiver. Among them we wish to acknowledge W. G. Tuller, Frank D. Lewis, R. L. Walters and Malcolm Bruce. Also to Warren Hunt for furnishing the brass and copper used in the cavity and the tools for working it.

[2] "More on Super-refraction," Ferrell and Wilson, *CQ*, Aug., 1947, p. 31.

THE AMATEUR NEWCOMER

(*from page 33*)

quartz. Each cut has its own characteristics, some more desirable for certain purposes than others.

The basic crystal oscillator circuit (*Fig. 5*) will be observed to be the same as the tuned-plate tuned-grid self-excited oscillator circuit, except that the crystal has been inserted in place of the grid tank circuit. In discussing the self-excited oscillator we pointed out that one of the tank circuits has greater effect upon frequency while the other has greater effect upon excitation, hence on output.

The circuit which has the greater *Q* or factor of merit will determine the frequency. *Q* refers to the ability of the circuit to store energy and release it when no longer supplied from an external source. The greater this ability, the higher the *Q*. An adequately constructed tuned circuit in which the values of inductance and capacitance are properly proportioned may be made to have a fairly high *Q* and thus afford some degree of frequency stability.

A quartz crystal has an exceptionally high *Q* and hence takes over the function of frequency control when employed correctly. When a small amount of the energy of the plate circuit is fed back into the grid circuit, usually by means of the grid-plate capacitance, the crystal will vibrate mechanically between its two mounting plates, setting up an alternating voltage between the two metal plates, and impressing this voltage upon the grid of the tube.

The frequency of this voltage is determined by the physical dimensions of the crystal, and, of course, in order to achieve an oscillatory condition, the tuned circuit employed in the plate section must resonate at the same frequency.

A number of circuits have been devised to permit the plate output of a crystal oscillator to be at a harmonic of the crystal frequency, rather than at the fundamental, and it is common practice to use such circuits in transmitter construction since they may save the expense of one or more multiplier stages. They are somewhat more difficult to construct and place in operation than is the straight crystal oscillator, however, and care must be taken in using them to avoid excessive current flow through the crystal, since this may burn or even crack the quartz plate.

In placing the experimental oscillator in operation, the builder will discover that he has immediate need of some means of determining whether the circuit is actually oscillating. This may be best done by soldering short pieces of wire to the terminals of a flashlight bulb or panel lamp, and connecting these directly across the link output terminals. A bulb of fairly heavy current carrying capacity should be used, since the oscillator will provide enough output to burn out less powerful bulbs.

Alternatively, a 1/4 or 1/2-watt neon bulb may be used by simply touching the base of the bulb to the capacitive output terminal. In either case the circuit is known to be oscillating when the bulb glows. The bulb is simply a device to make the radio-frequency output visible.

Obviously, the oscillator must have power supplied from an outside source, and when this power supply has been connected and the correct coils for any of the several self-excited oscillator circuits inserted, the tuning controls may be varied until output is visible as a glowing of the indicator lamp. As a starter, the simplest to use is the tuned-plate tuned-grid circuit. Insert the coils and set the grid capacitor at about mid-scale. Apply the power and rotate the place capacitor slowly. At some point in the mid-scale region the lamp will begin to glow, and careful adjustment of the plate tuning capacitor will cause the glow to become very bright.

If an all-wave receiver is available (and anyone seriously contemplating ham radio should be a regular listener, particularly to c-w signals) it may be tuned to the 7-mc region, and the signal from the oscillator will be heard somewhere in that neighborhood. It should be pointed out that, with the constants given, there is a considerable frequency range in the oscillator. In order to place the oscillator in the 7-mc ham band (40-meter band) for example, the receiver should first be tuned to find the signal. If the signal is too high in frequency it must be lowered, and conversely, raised if too low. This is readily done by moving the grid tuning capacitor a bit at a time, following with the plate capacitor to keep the output as high as possible.

If the frequency had originally been too high, we know that the grid capacitor is too far out of mesh, and the plates must be brought closer together so as to lower the frequency; and the opposite holds if the original frequency was too low.

When the crystal is employed, it will be necessary to construct two jumpers so as to provide needed connections in the grid circuit. The crystal connects between terminals 3 and 6 of the grid socket, and a holder should be used which will plug into this type of socket. Any prewar standard crystal holder will do this, but some of the newer crystals are provided with holders to plug into octal sockets, hence will not meet our needs.

It is necessary to connect terminals *1* and *3*, and terminals *5* and *6* in order to complete the circuit, and this may be done by two small jumpers formed from tube-base prongs and copper ribbon. Prongs are selected which will fit terminals *3* and *5*. These are removed from the tube base by breaking the base, placed in their respective socket holes, and carefully marked with a scribe to indicate a point level with the surface of the socket. They are then removed and sawed across at this point, and filed a bit to remove burrs. Two pieces of copper ribbon or thin copper sheet, about 1/4" wide and an inch or so long, are tinned by flowing solder on them, and then wiped clean while hot.

A prong may be held upright in a vise, and a piece of the copper held with its flat side against the sawed surface of the prong. The two are soldered together in this position. The other prong and piece of copper are treated similarly. The prongs may now be reinserted in the socket, and positioned so that the pieces of copper extend over the holes into which the crystal is to be plugged. The location of each of these holes is accurately marked on the copper, and a hole drilled to admit the pins of the crystal holder. The copper strips may now be trimmed so as not to be too long. When the crystal is inserted in the socket, the holder pins make contact with the copper strips, and the circuit is completed. The crystal holder keeps the jumpers securely in position.

In tuning the crystal oscillator it will be found that the procedure is somewhat different from that used in tuning the self-excited oscillator. It is necessary to get the plate-circuit frequency rather close to the crystal frequency before oscillation commences. It will be found that when tuning from the low side of resonance the crystal "snaps" into oscillation, while in tuning from the high side the approach to oscillation is somewhat gradual. The crystal should not be operated at its point of maximum output, since this is just at the "snap in" point, and a slight drift in frequency, due perhaps to heating, may cause the crystal to fail to start oscillating when power is applied. It is advisable, therefore, to adjust the plate tuning to a point just to the "gradual" side, and thus make oscillation more reliable. Always tune from the high side to the low when tuning a tuned "plate" crystal oscillator.

All of the coils shown are designed to resonate in the amateur 40-meter band. As pointed out earlier, they will also resonate at points outside this band. Thus the oscillator is capable of causing interference with services already licensed, including amateur. For this reason always remember to operate the oscillator at low input and to use a dummy (light-bulb) antenna.

The keying jack shown may be used for either of two purposes. A key may be inserted and employed to break the emission of the oscillator into the dots and dashes of the familiar International Morse Code. Alternatively, a milliammeter may be plugged into this jack. It will read total current drain, which will include grid, plate, and screen current. If used, it should have a range of 100 milliamperes or more. A cheaper device would be a 150-ma panel bulb so connected as to plug into the same jack. The brilliance to which it lights will give an indication of the amount of current being drawn.

It will be observed that when the circuit is being supplied with power but is not oscillating, the current consumption will be relatively high. As soon as the controls are adjusted to start oscillation, the current will decrease, and optimum operation is achieved when the current drain is at a minimum. As the oscillator is loaded, however, the current drain will increase. That is, the minimum current is observed when there is no load across the output terminals. If a lamp load is applied to these terminals, the current drain will be observed to increase. If some of the plate-circuit energy is drained off into the load, the plate circuit must then be provided with additional energy from an external source, which in this case is the power supply, and the supply of this external energy is the increase measured by the meter.

General Considerations

Regardless of the type of oscillator, and irrespective of the frequency, certain general rules must be kept in mind. Mechanically, the oscillator must be as well constructed as lies within the builder's power. All components should be firmly tied down so as to lessen the chance of mechanical instability, and only the best grade of parts should be used. The power supply used to provide plate and screen voltage should be stable with reference to the load placed upon it; that is, it should have good regulation. If the oscillator is of the self-excited variety, the power supply should preferably be of the voltage-regulated type.

Components should be operated well within their ratings, so that no appreciable amount of heat develops, and there should be adequate ventilation to provide for the rapid dissipation of that heat which does arise. The electrical design should be such as to minimize the frequency effects of temperature variations and power-supply fluctuations.

The oscillator should be lightly loaded. It is difficult for a heavily loaded oscillator to start when turned on; moreover, a heavy load increases the power supply drain, tending to impair voltage regulation and increase the amount of heat which must be dissipated.

The above are but the primary considerations in the design of an oscillator. There are other more technical points which have no place here. If the above suggestions are followed, however, many of the difficulties connected with oscillator construction and operation will be obviated.

MODERN RECEIVER

(from page 26)

in a hurry. The filter choke, *L3*, might be open, thus preventing the proper current flow to *pin 2*.

F. With the high voltage present on *pin 2*, *S5* and with the proper filament voltage, turn off the a-c input and proceed with tests on the receiver proper.

G. Remove the rectifier tube, 5Y3GT. Place the tubes in the receiver, making sure to locate the 6AK5 in the front socket and the 6C4 in the rear. Plug the power supply cable into the socket, *S5*. Operate *SW2* on the power supply. Look for the faint glow of the filaments of both the 6AK5 and the 6C4. The position of *SW1* on the receiver panel has no effect on the filament circuit. Do not proceed until the tubes light properly. When this has been determined turn off the power supply and remove the tubes from the receiver.

H. Replace the 5Y3GT rectifier tube. Operate *SW2* and after a 15-second wait turn the standby switch, *SW1*, on. Measure with the d-c voltmeter (or its substitute), between the following points, and ground to test for the presence of high voltage.

Location	D-C Volts (Approx.) Tubes Out	Tubes In
Pin 5, S2	275	275
Pin 5, S3	265	100
Pin 6, S2 (*R2* full clockwise	40	35
Pin 6, S2 (*R2* full counter clockwise)	0	0
Pin 7, S3	0	5
Pin 2, S5	285	275

I. After ascertaining the presence of these approximate voltages, turn off the a.c. Replace the tubes in the receiver. Place a coil (preferably a 7-mc coil) in socket *S1*. Rotate the regeneration control *R2*, counterclockwise. Set the bandset condenser at about 10 or 20 degrees "in." Plug a pair of high-impedance headphones into jack, *J1*. Switch on the a-c input, and after a 15-second wait, turn on *SW1*.

A slight hum may be heard in the phones. Turn the regeneration control, *R2*, clockwise until a rushing sound is heard. This is the customary regenerative hiss and should appear when *R2* is rotated to near the mid-point of its range.

Connect a short antenna (a piece of wire, 2 to 5 feet long), to *antenna post 1*. Rotate the bandset condenser *C2* until signals are heard. Maintain regeneration by operating the knob on *R2*. When a signal is heard, its presence will be indicated by a whistle in the phones. If the signal is a radiotelephone station, it will be necessary to back up the regeneration control until the whistle stops and the voice becomes clear. If the signal is from a radiotelegraph (c-w) station it is necessary to provide an oscillating detector to hear the unmodulated signal. A little practice will reveal that the sensitivity of the receiver depends somewhat on the proper setting of the regeneration control. Too much regeneration will cause squeals and loss of sensitivity. Do not operate the regeneration control advanced beyond the point where the detector is oscillating, as indicated by the rushing or hissing sound.

Check the position of the knob on the shaft of *R2* as follows: Rotate the control counterclockwise as far as possible. The pointer on the knob should now be set at about "8 o'clock." Rotate the knob clockwise to the other extreme and the knob should point to about "4 o'clock."

With the pointer knob adjusted properly on the shaft of *R2*, check the position of the cathode tap on the coils, *L1*. In most cases, proper operation will be obtained about mid-point on *R2*, that is, at about "12 o'clock." A few degrees one way or the other will make little difference.

After locating stations on the band-set dial, rotate the bandspread dial and you will find it easy to tune stations in and out by means of the slow-motion knob.

Having become familiar with the controls, proceed to locate the amateur band on the coil in use. With a 140-μf condenser as *C2*, the amateur bands will be found at about 15 to 20 on the band-set dial (when the dial reads 0 to 100 degrees, with the condenser *C2* out at zero). If *C2* is 100 μf more of the condenser will be required to resonate *L1* to the amateur bands.

The dial on *C1* should be placed with the condenser full in at the zero setting on the dial.

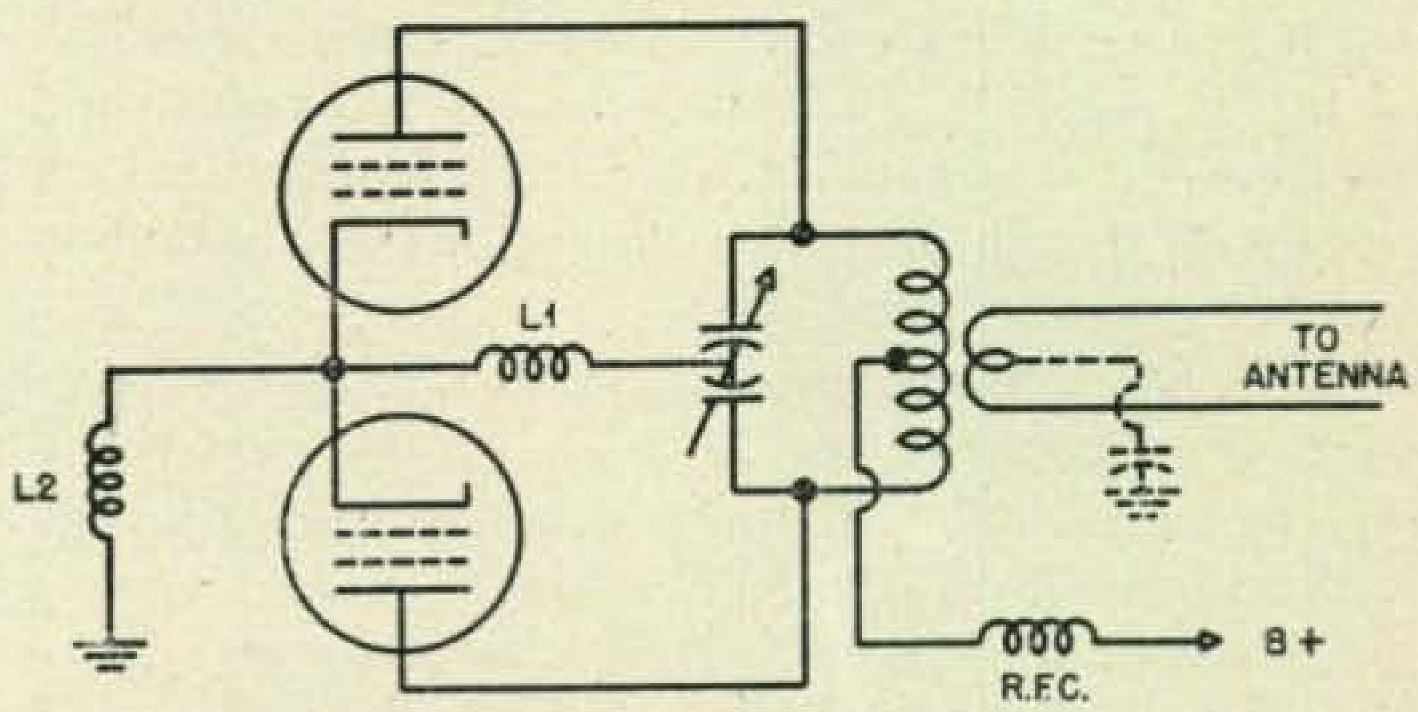
With the bandspread taps (*C1*) as shown, and with the components indicated, the amateur bands will be spread across the dial in the most advantageous manner. The 3500 to 3850 kc c-w band will cover about 70 degrees of the dial, 3500 kc being located at about 5 on the dial. A portion of the 75-meter radiotelephone band will also fall on the dial. In order to have bandspread on the phone band, *reduce* the amount of band-set capacity; i.e., turn the dial to a lower reading, and tune in the stations with the slow-motion dial knob. The 7-mc amateur band will be spread across about 70 to 80 divisions on the dial, with 7,000 kc at about 5 on the dial. That c-w portion of the 14-mc amateur band from 14,000 to 14,250 kc will cover about 60 to 70 divisions on the dial. To cover the 20-meter phone band and above, reduce the capacity of *C2* and retune.

The coils shown will cover, in addition to the 14, 7 and 3.5-mc amateur bands, a wide portion of the spectrum on either side of the amateur bands. By resetting the band-set condenser, *C2*, various portions of the spectrum can be located, and then through the use of the slow-motion dial (the band-spread condenser, *C1*) stations may be tuned in without difficulty.

DOWN WITH HARMONICS!

(*from page 29*)

Circuit elements, having a common series impedance, are believed to consist mainly of stray circuit inductances, although the presence of LC parasitic loops is not an impossibility. For instance, the r-f choke coil that feeds plate voltage to the tank coil, is in series with both tubes. It cannot tell which of the two push-pull connected tubes is responsible for a pulse of current. As far as this choke is concerned, all plate current pulses are in the same direction, even though they could be of alternately differing amplitude.



The illustrated circuit shows the choke as a common series element. It also shows other parasitic elements which are more responsible for the development of second harmonic voltages. Note the stray inductance, designated *L1*, located between the rotor of the split-stator condenser and the center tap of the filaments, and the inductance, *L2*, between the filament center tap and the reference ground point of minimum r-f voltage. A study of the wiring and shielding and bypassing used in most push-pull amplifiers will reveal a number of common series impedance elements that can develop considerable second harmonic voltage. But that does not condemn the designs.

Although it is possible to reduce the value of the common series elements by carefully applied design practices, such designs are apt to cause other difficulties. Furthermore, it is easier to attack and conquer the even harmonics at a place where they have been reduced in intensity.

It was previously stated that the second harmonic energy appears as a voltage, i.e., a voltage with reference to the ground-return point. This means that very little of the harmonic power would ordinarily be transferred to the antenna by electromagnetic induction between the tank coil and the pickup loop. Fortunately, the transfer is by capacitive coupling, and the second harmonic energy appears as a voltage-to-ground on the pickup loop, which is usually a low impedance element. If the pickup loop is grounded to the chassis through a bypass capacitor, or by means of a piece of wire, the second harmonic is short-circuited, and for most practical purposes, eliminated.

Although there may be second harmonics in many push-pull amplifiers, all of them will not radiate this energy. It must be understood that the second harmonic voltage, due to common series impedance, will be quite low, because the stray inductance is low. Trouble can be expected when the total length of the antenna and feeders is near to an odd number of quarter wavelengths at the harmonic frequency, and the feeders have a fairly high capacity to ground. Then it takes but a few volts to fully excite the antenna, and radiate a great deal of power.

Incidentally, an antenna coupler can not be depended upon to get rid of second harmonic radiation from a push-pull amplifier. In the tests conducted at the author's station, the antenna coupler had almost no effect.

The first suspicion of the "push-push" effect came when a test was made with one of the final tubes removed. When this was done, the fundamental signal dropped but slightly, while the second harmonic almost dropped out completely. More work, with the aid of several cooperating amateurs, unveiled what is believed to be a new understanding of an old problem. Even harmonics do not necessarily cancel out in a push-pull stage.

THE COBWEB

(from page 22)

conventional-length two-wire folded dipole mounted at the same height and as near as possible to the same position. W6RBQ and W6ERS at about two miles could detect no difference in the two antennas. This check was made inadvertantly since we thought at the time that we had a beam only to find subsequently that the parasitic element was so hopelessly short as to have negligible effect!

Perhaps we can keep someone else from making the same error if we confess that in our initial setting of the tuning stub we neglected to open this stub at the ends. Therefore the meter was shunted and merely became less sensitive as we moved it toward the closed portion of the stub. The final effect, however, was most realistic and totally deceiving. When the bottom of the stub was opened and the adjustment procedure repeated, it was found that the length had to be increased another 14" in order to find the resonant point. Since this resulted in a stub about 4' long, the present end-capacity-loading was devised as a means of reducing the stub to its present length of approximately 18".

Summary

It is not easy to evaluate the relative merits of any beam since there are so many factors that must be taken into account. Judged from a standpoint of gain, this beam measures up to within about 1 db from the theoretical predicted maximum. This is, of course, merely in a horizontal plane and does not take into account gain at higher angles. From the shape of patterns produced with different adjustments of the parasitic element we can state that this beam appears to duplicate the patterns obtainable with full-length types. It is likewise capable of deep and precise end nulls when adjusted

Classified Ads

Advertising in this section must pertain to amateur radio activities. Rates: 25c per word per insertion for commercial advertisements. 5c per word for non-commercial advertisements by bona fide amateurs. Remittance in full must accompany copy. No agency or term or cash discounts allowed. No display or special typographical ad setups allowed. "CQ" does not guarantee any product or service advertised in the Classified Section. Closing date for ads is the 25th of the 2nd month preceding publication date.

BEAM CONTROL CABLE. New material. 2 No. 16; 6 No. 20 rubber insulated, coded, tinned conductors. Weatherproof rubber jacket. Heavy overall braided shield. ½" diameter. Value 30c foot. Real buy 11c foot. F.O.B. Chicago Associated Industries, 6639 Aberdeen Street, Chicago 21, Illinois.

GENERAL RADIO variac - variable auto transformer, type 100, 2000 va. $17.50 f.o.b. Type 200, 860 va, $7.50 f.ob. No trades. W2RTM.

QSLs. Samples for stamp. Henry L. Carter, Jr., W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

CHASSIS ALUMINUM. Custom built, any size, shape. 17x13x3, $2.50 Other sizes, other prices. Write for quotation, folder. John Heim, 713 West 3rd St., Williamsport, Pa.

AMATEUR RADIO LICENSES. Complete code and theory preparation for passing amateur radio examinations. Home study courses. American Radio Instutite, 101 West 63rd Street, New York City.

EC-455 B EASILY CONVERTED to hot 10 meter receiver, fixed or mobile. Instructions schematics $1.00 Brown, 3327 Geronimo, Tucson, Ariz.

T23:ARC5 XMITTERS 100-156 mc. auto-tuned. New, never used, with tubes, less crystals—$15. W2GVF, 98 Bodine, Staten Island, N. Y.

HOW IS YOUR QUALITY? Measure amplitude distortion in your phone transmitter with your voltmeter, without audio oscillator. Simple diode and R-C circuit. Instructions. 50c. Paul Hawkins, 1306 E. 27th ,Kansas City, Mo.

SCR-522 SCHEMATICS, set of 4—$1.00. Xmitter, receiver, rack, dynamotor, controls—10 x 17. Receiver BC-624A or BC-624AM—6 x 20. Simplified diagram of control circuits—5 x 7. Picture diagram parts location BC-624A or BC-624AM—7 x 10. W2GVF, 98 Bodine, Staten Island, N. Y.

QSLs. SWLs. New designs. Beautiful stock. Smaples? Write W9BHV QSL Factory, 857 Burlington, Frankfort, Ind.

QSLs. Quality cards priced right. Samples. W9UTL, 1768 Fruitdale Ave., Indianapolis, Ind.

QSLs? SWLs? Unbeatable samples 20c. Sackers, W8DED, Holland, Mich.

FOR SALE: Scott communication receiver, Type SLRM. Finest communication receivers made for world-wide reception. Four wave bands including broadcast. Used three months. $200.00. Dr. E. F. Miller, Lambrecht Bldg., Idaho Falls, Idaho.

ERECO BEAM ROTATOR. 110 vac, heavy duty, variable speed, Selsyn indicator, weather-proofed. Complete indicator and rotator ready to plug in—$69.95. Satisfied users all over the country. Buy from your dealer or direct. Free literature. Dick Rose-ERECO, 2912 Hewitt, Everett, Washington.

NEW X7018 Sylvania modulation meter—$24. New VHF-152, never been fired up, makes BC348 super—$75. D104 mike and stand, factory rebuilt, good as new—$12. Will ship C.O.D. Send deposit. W9JYP

SELL a-c operated Instructograph with ten tapes and instruction book. Used, but good as new. Best offer. W9YDP, Butlerville, Ind.

FOR SALE: Best cash offer takes SWL Globe Trotter and National NC-57 receiver. Both good as new, used about 2 months. Transmitter complete with coils, tubes and one crystal for 10 meters. Insurance and shipping charges prepaid to buyer. Robert W. Randall, WØRNR, Plains, Kan.

COLORTONE QSLs! Modernistic! DX'ers! Rainbows! Cartoons! Outstanding craftsmanship! Colortone Press, Tupelo, Miss.

FOR SALE: RME-45 calomatic dial, perfect condition—$140. New DB-20 pre-selector—$35. Will gladly demonstrate. B. Prusinowski, 272 W. Tallmadge Ave., Akron 10, Ohio.

CRYSTAL KIT: Includes 4 low drift, highly active crystals, 2 holders, abrasive, instructions, treatise. State band preferences from 3500 to 8500 kilocycles. $1.00 complete. Mounted crystals-your specified frequency—$1.00 each. Breon Laboratories, Williamsport, Penna.

WITH A STRAIGHTEDGE—attenuators, filters, two meter loaded coax and linear tanks, transmission lines, db and vu, cathode follower, etc. In stock, one dollar postpaid. Satisfaction guaranteed. Nomographs, Inc., Lawrenceville, New Jersey.

SELL HOWARD 460 nine-tube communications receiver; .540 to 42 mcs.; built-in frequency meter; S meter; xtal filter; noise limiter; external speaker in matching cabinet; excellent condition. $50.00. Dr. Stauffer, Priest River, Idaho.

BROKE-MUST SELL, 50% or more off net, all components for two 1 kw transmitters, plus many other parts. Not "surplus". All new or near new and guaranteed. Too numerous for a list. Write your specific needs. All inquiries answered. W2RTM, Rt. 72, Schenectady, N. Y.

FOR SALE: Clean RME-69 with DB-20 in same cabinet. Factory installed noise limiter, crystal etc. $115.00 or best offer. Also 300 watt 10 meter fone rig. Rack and panel construction in open rack. Reasonable, write for details. W1PIL, 1 Hemans Court, Worcester, Mass.

SURPLUS—DELUXE CRYSTAL FINISHING KITS containing holders, quartz blanks, abrasive, etching fluid, complete instructions. Only few hundred left at $2 each postpaid. Formerly sold $8.75. Vesto Company, Parkville, Missouri.

MUST SELL: Hammarlund Super-Pro, army rack model with power supply—$85. Transmitter, 375 watts c.w. to P.P. 814's, V.F.O. control—$150. W9HMO, 2551 No. 8th Street, Milwaukee, Wisconsin.

10 METER 3 ELEMENT BEAMS—$19,50. Send card for free information. Riverside Tool Co., Box 87, Riverside, Ill.

IN STOCK: New and used Collins, Hallicrafters, National, Hammarlund, RME, Millen, Sonar, Meck, other receivers, transmitters, etc. Lowest prices. World's best terms. Reconditioned S38 $35.00, S40 $59.00, SX42 $199.00, SX28 $139.00, SX28A, HQ129X $139.00, SPC400X $249. HRO Sr $119.00, NC240D $149.00, NC101X, NC100X, DB20 $29.00, DB22A $49.00, VHF152 $59.00, RME45 $119.00, RME84, SX24, SX25, SX16, SX17, other receivers, transmitters, etc. Shipped on approval. Write Henry Radio, Butler, Mo.

FOR SALE: Very slightly used RME-45 with matching speaker. Cost $178.00. Price $135.00. Edward Cruz, 4 Pearl Street, Stonington, Conn.

SX-28, excellent condition—$147.00. Jack Irwin, Candler Field Br. P. O. Atlanta, Georgia.

WØFOR selling out! Bargains galore in everything in radio. Also Instructograph, oscillator and tapes.

FOR SALE: Brand new Hammarlund Super-Pro SP-400X used approximately 100 hours—$300.00 f.o.b. New York. Arthur Stangel, 2121 Cedar Avenue, New York 53, N. Y.

LOST! The author of the very fine transmitter article ending up with parallel 807s. No identifying marks on the manuscript. Please contact CQ Editorial Office.

for the type of pattern in which such nulls appear. No compromise has been made as regards the feed system and the S-W-R is very satisfactory when the antenna is properly adjusted. This method of using parallel twin lead to obtain a suitable impedance value at the center of one of the parallel elements offers good possibilities to the users of conventional beams with tubing elements. There is no particular reason why one or two sections of twin-lead cannot be fastened to a tubing element; the connections to the existent element being made at or near the ends and the transmission line connection made to one wire of the twin lead. This should be particularly effective where the tubing element is closed in the center as in the familiar Plunbers Delight beams.

So in summary—The Cobweb:

Come up into my parlor said the Spider to the Fly
I'd like to show you something even Barnum would deny.
He says this thing works broadside—regardless of the bends,
If he tries it any shorter, it will work right off the ends!

SELSYN BEAM ROTATOR

(from page 28)

gear crank must be used in the shack to overcome the inertia of the beam. Several methods of showing direction and azimuth will probably occur to you at this point. In our particular case we use a great circle map on San Francisco located where an extension shaft from the selsyn will protrude through the center. A pointer attached to this shaft indicates the direction of the beam antenna.

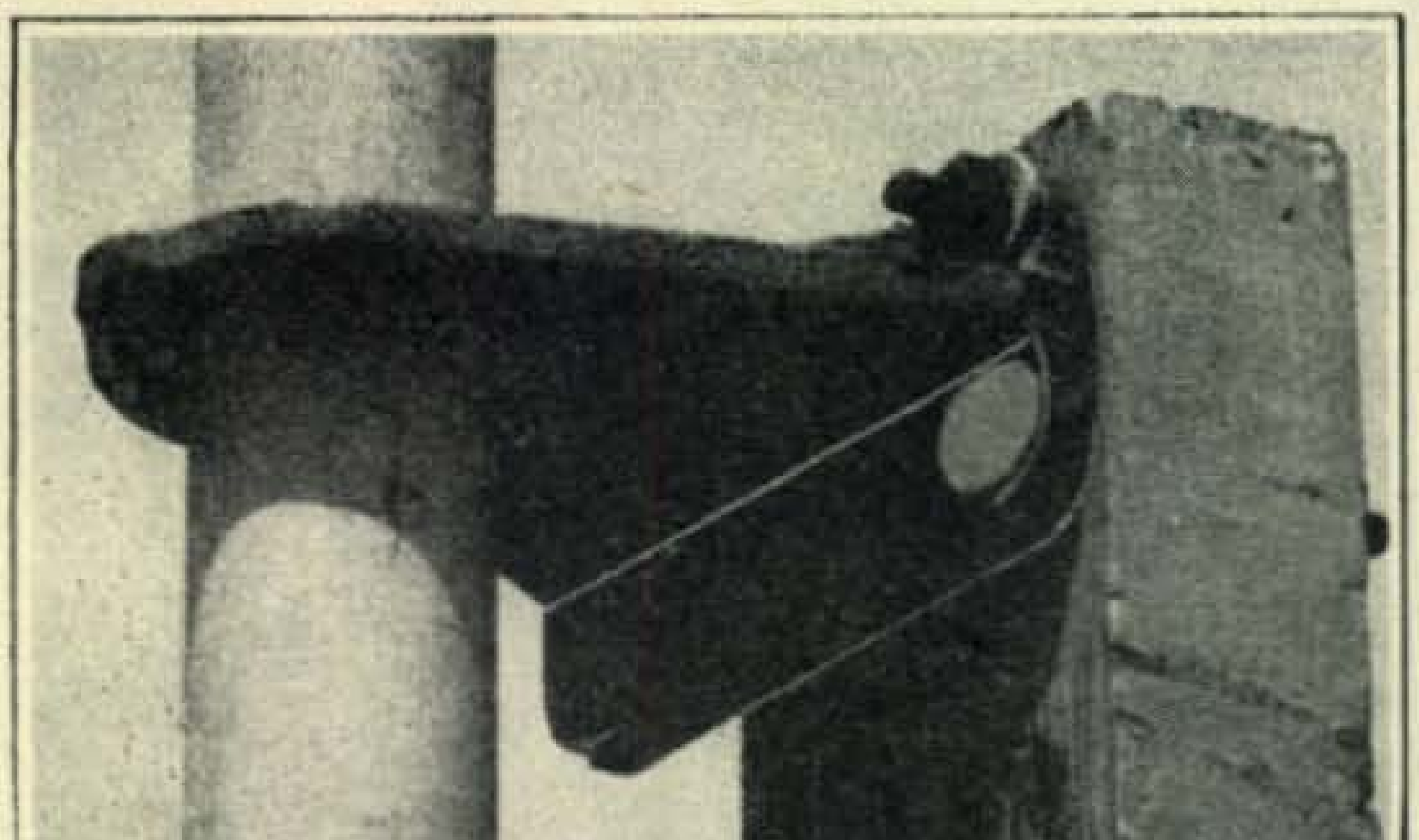


Fig. 3. The Bendix type heavy duty selsyns come complete with two heavy mounting brackets. One of these can be removed and used as the upper bearing for the rotating steeltube. The bracket is supported by a 2x4.

It will probably also be found necessary to incorporate a brake of some sort at the base of the beam to stop it from rotating too much in the wind. This should be one of the electrical solenoid operated type working on the 110-volt a-c line. These relays are currently being advertised and are inexpensive. They should be connected as shown in *Fig. 1* so that when the selsyns are energized for rotation, the solenoid plunger will automatically release the brake band around the steel tube at the base of the beam. The brake band will then be reset when the a-c current is shut off.

CQ Ad Index


RCA