RADIO

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THE WORLDWIDE TECHNICAL AUTHORITY • OF AMATEUR • SHORT WAVE AND EXPERIMENTAL RADIO •

This Month

A Versatile, 60 Watt Amplifier or Modulator

◆

Construction Data on the Bruce Folded Array

◆

Negative Feedback Applied to Class B Audio

◆

The Most Simple Universal Antenna Coupler

◆

Remotely Controlled QSY by Means of Relays

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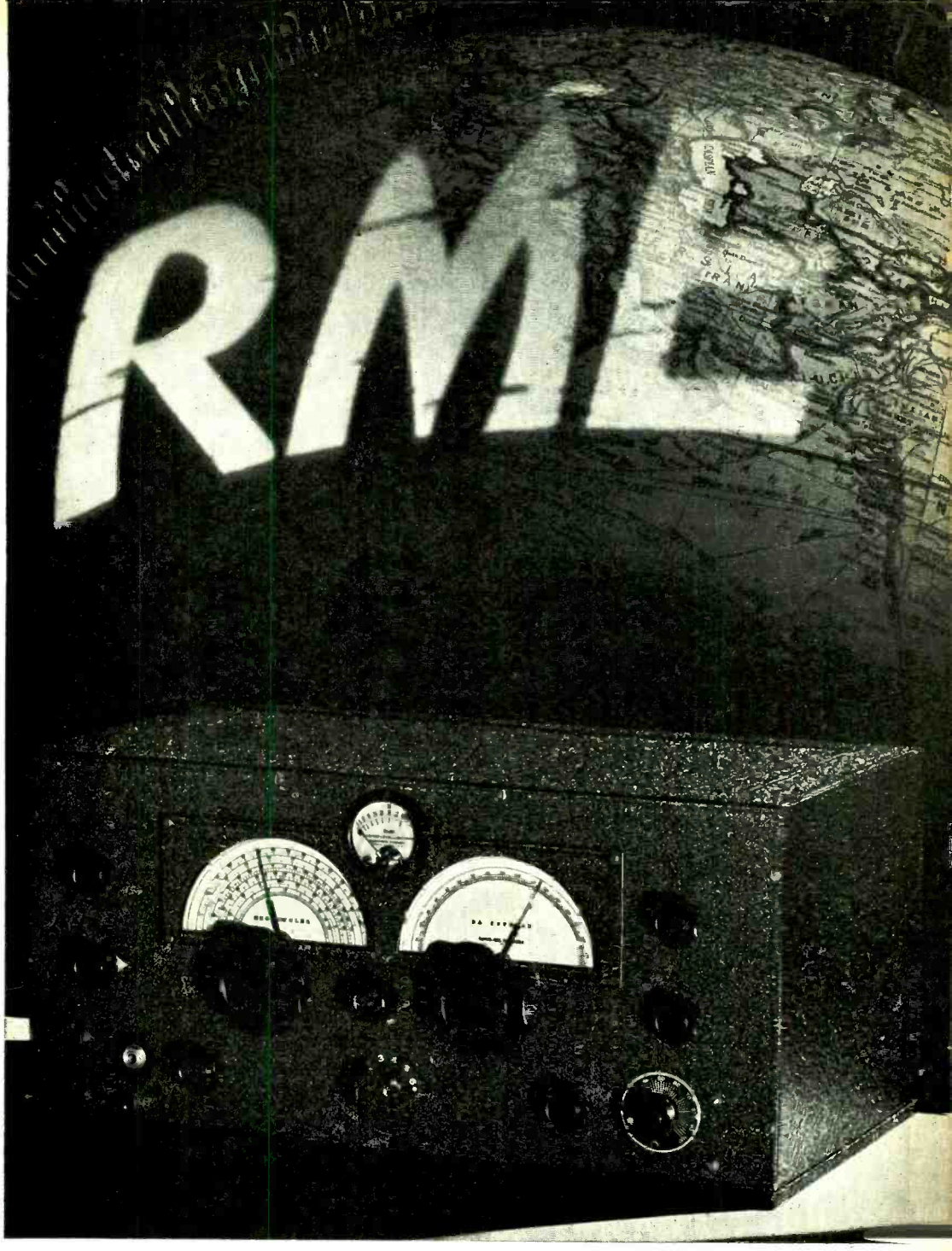

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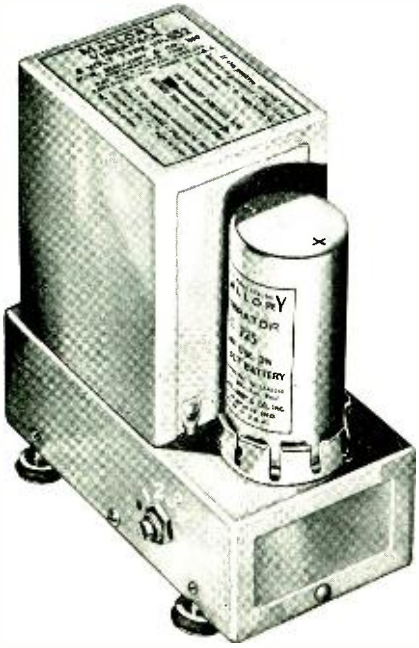

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No. 221 July, 1937

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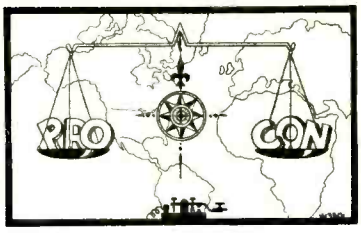
"RADIO" CONTRIBUTIONS

Contributions to our editorial pages are always welcome; though they will be handled with due care we assume no responsibility for those which are unsolicited; none will be returned unless accompanied by a stamped, addressed envelope. We do not suggest subjects on which to write; cover those you know best; upon request, we will comment on detailed outlines of proposed articles, but without committing ourselves to accept the finished manuscript.

Since we regard current "chiseling" policies as decidedly unfair, a small payment will be made, usually upon publication, for accepted material of a technical or constructional nature. Freehand, pencilled sketches will suffice. Good photographs add greatly to any article; they can easily be taken by the layman under proper instructions. For further details regarding the taking of photographs and the submission of contributions see "Radio" for January, 1936, or send stamp for a reprint.

THE OPEN FORUM



WHAT USEFUL IDEAS?

St. Paul, Minn.

Sirs:

. . . wish to say that I am well satisfied with your mag and like it, *except* for the childish argumentation of the "Open Forum" in the last two or three issues. I think that is a waste of ink and paper. Why not use said space for some useful ideas sent in by various readers?

CARL MACUMBER.

•

"CODITUS"

El Paso, Texas.

Sirs:

It seems to me that the hams in this country are ever ready to take sides on some fool question or the other, as page after page in RADIO and QST will prove. Hence, I want to get my pet peeve in for a share of the hams' time. It is nothing new, but has been neglected in recent months.

I am one of those poor saps who can't learn the code. All I can do is crank my receiver across the bands and watch some other mug take a crack at dx or rag chews that might well be mine if I just knew the code. Not many of the boys are willing to believe that occasionally a man cannot learn to copy 13 w.p.m. They say such a lad is just plain lazy or so hopelessly stupid that he has no place in ham radio. I suppose that they are right in some cases, but I'll bet there are also quite a few fellows in the same boat with me and they are the ones I want to reach.

I have made an effort to learn the code and, since I can't get up any speed, I have devoted all my spare time to acquiring a sound knowledge of technical radio. Now, after nearly five years at it, I feel that I am as well qualified as the next fellow to a place on the phone bands. Why can't the authorities hold a no-code exam on advanced radio? Such an exam, if passed by an applicant, would entitle the holder to all the privileges that the present class B tickets allow. Then, after a year's experience, it would be extended to include operation in the restricted bands. The examination should be made fairly tough to discourage those fellows inclined towards laziness. But, of course, it should not be too tough, for that might embarrass the A boys!

I think that one of the best cures for all the troubles that we hear so much about would be a nice juicy examination. I'll bet the congestion would be relieved quite a little.

I would like to hear from others on the above proposals.

ROBERT WELLAR

•

"OUR HOUSE IN ORDER"

Sydney, Australia.

Sirs:

The letter in the April "Open Forum" of RADIO, "Nineteenth the Motion" by W9UBB, attracts my attention.

It is certain that in his observations he must be voicing the opinion of many thousands of level-headed amateurs in U. S. A. Among other things, he suggests government monitoring stations and a probation period of at least a year. In view of his ideas, I would draw attention to the methods now adopted in Australia to make the air better for all of those who use it (at least in VK!) and not for just a few.

In the first place, it must be firmly realized that here in VK we are permitted the use of phone on the 7 Mc. band. Two years ago things reached such a chaotic state because of the blabber of irresponsibles armed with a license (not all of them) and gear of sorts, plus a microphone of worse sorts, that something simply had to be done about it.

With the public using dual and all-wave receivers, the fact was brought home to the PMG's department through continuous complaint that the 40 and 20 metre bands in particular were no longer just amateur stamping grounds where everything went on "in camera". With the cooperation of the W. I. A., amended regulations were framed and a vigilance scheme put into operation. These vigilance officers were elected by the amateurs themselves who were voting members of the Institute. Sane discussion convinced everybody that a *self-policing* method of action would be for the best interests of all.

Almost a year has gone by with the scheme in action. Both the department and the amateurs are gratified with the results. The air is

considerably cleaner (again I say, in VK) and raps over the knuckles for blatant or accidental offenders are few and far between. No sensible person is offended when it becomes necessary to issue an official reminder that such-and-such a station was observed committing an irregularity. The effectiveness of the scheme is shown by the fact that no person has been known to offend twice.

Now American amateurs are beginning to suggest that something akin to the VK Vigilance scheme be adopted, according to W9UBB's letter. If things are as bad as the letter states—and no doubt they can be with about 40,000 licensed amateurs of all categories on the air—it seems that sooner or later something will have to be done about the U. S. A. situation also. If such becomes the case, it would be far better for the amateurs to take the first step in policing the air, rather than to have the authorities wade in and clamp down on you.

A.R.R.L. struck the right note in the phone observation form issued December, 1936, to OO's, when it mentioned that "the best way . . . is to watch ourselves and brother hams—that we may adopt sound policies for operation—and prevent a few from bringing down some VK type regulations on all of us."

The latter part of this statement, in which the "VK type regulations" are mentioned, will be looked upon with a bit of askance by the average W. However, is there anything wrong with such regulations? Well—there is, of course, from the W viewpoint. Wouldn't there be a big outcry if W's were confined to an input of 25 watts to the final!!!?

After all, 25 watts misapplied can cause a great deal more trouble than a kilowatt used as it should be. It's all in the individual and the grey matter in his think-box.

The VK ham makes the most of his QRP as W phones are well aware, and he has cleaned up fairly well his own previously dusty house. He did the work himself and if he bears any resemblance to a genuine radio amateur, he is reasonably well satisfied with his regulations, which are not imposed harshly but are introduced with the kindly tolerance of an understanding regulatory department.

DON B. KNOCK, VK2NO,
Radio Editor, "The Bulletin".

TAX THE HAM?

Richmond, Ky.

Sirs:

I have not been active for about two years or more on any of our bands except five and not very active there. I recently bought an expensive receiver and spent quite a bit of money rebuilding my transmitter on steel pans and racks, anticipating much enjoyable operation on all bands.

My anticipation has been turned to disgust at the conditions which exist on most of our bands today, and it seems that it is an utter impossibility to get hams or their authorized (?) representatives to police their own bands of some of the hogwash and rotten operating with which they are infested.

It is our duty as citizens to make better citizens of these law violators in our own bailiwick, and if we can't handle it (and it seems we can't, in spite of many, many complaints appearing in ham publications), then we must establish some machinery which will handle it.

Personally, I have enough money invested in radio equipment to want protection for my investment and would gladly pay a yearly license fee, if payment of such fee would provide government inspectors sufficient to control the situation. I believe that as tax paying individuals, we would be in a better position to demand enlargement of our bands from our government.

I have been actively interested in radio since 1909, although my parents forcibly prevented much activity between 1910 and 1915, after I ruined a couple of window casings. After I took up radio again in 1915, I was drawn into military service early in 1917 and have been with the army ever since. After the ban was lifted, I opened up with regulation army equipment of the type developed in 1918 (but never issued to troops!) and was operating a c.w. and fone transmitter as well as ¼ kw. 500 volt spark set and ½ kw. 60 volt synchronous spark set under the call of WUBC, a semi-official call issued to the Field Artillery School, Ft. Knox, Ky. The receiver was a Grebe CR-3.

From the above you can see I am no newcomer to the game. I operated a c.w. station at a time when most amateurs "looked down their noses" at c.w. and when there were not more than a dozen c.w. stations in the country. I recall most vividly 9XM, 9XI, 4XB, 2ZE, and a few others. At any rate, I operated

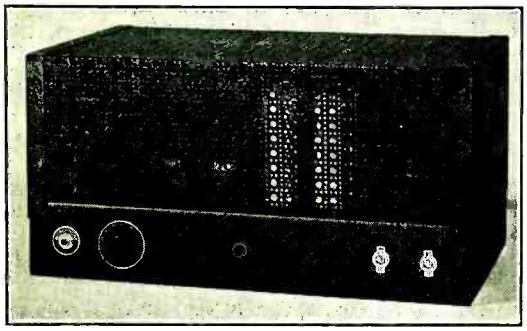
[*Continued on Page 18*]

A Versatile 60 Watts of Audio

By Ray L. Dawley,* W6DHG

One way to get 60 watts of audio is to use a pair of 6L6's and drive them hard, provided you can tolerate some distortion and rather short tube life. Another way is to use four 6L6's and let them loaf. In the long run the latter method is just as economical, besides having many other features to recommend it.

We have been receiving numerous requests for a description of a self contained modulator capable of enough output to modulate the "Bi-Push", the T-20 rig and other transmitters of similar power capabilities. In addition such a modulator should be able to be used as a driver for a higher powered modulator, and should preferably have provision for use as a high-power public address amplifier. The unit to be described is suitable for use in all these capacities.



The 60 Watt Amplifier with Cover

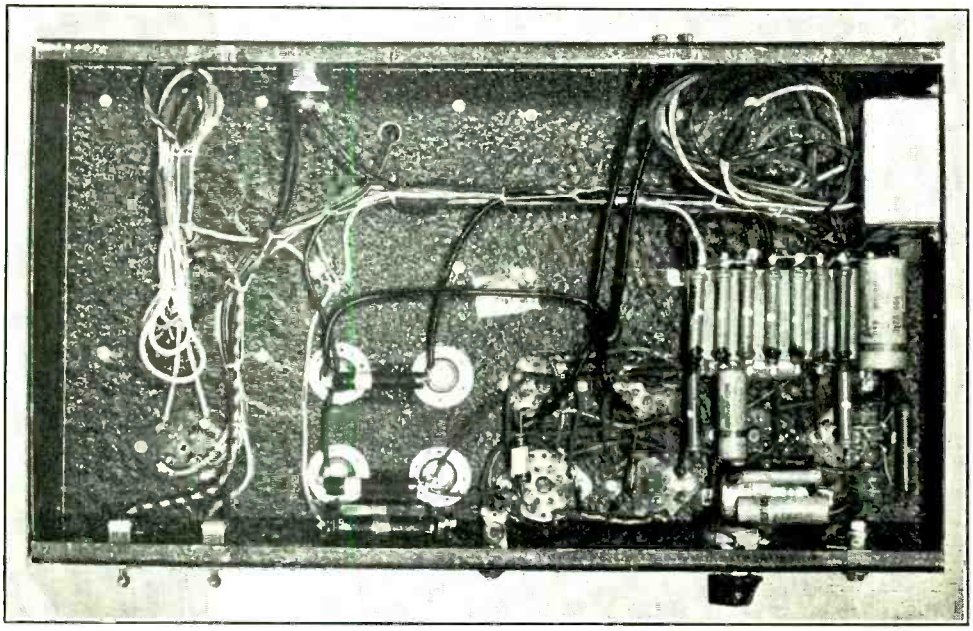
To begin with, it is primarily designed for use on voice frequencies. The response is flat within 2 db from approximately 180 to 10,000 cycles. Below 180 cycles (the lower limit of useful voice frequencies) the gain falls off rapidly (desirable for voice work). The distortion is very low (undetectable on the 'scope) for all frequencies in the voice range at the amplifier's maximum output of 60 watts. As a matter of fact, should it be desirable to use the amplifier for high quality reproduction of music, it would only be necessary to change the output transformer to a high fidelity one designed for the purpose. This done, the amplifier would give very wide frequency response with unusually low distortion.

While the amplifier is designed for only 60 watts output, four 6L6G tubes are used in the output stage. While two of the same tubes are capable of approximately this output under the very maximum conditions of drive, the life of the tubes is frequently very short. By using four tubes instead of the conventional two, many advantages are accrued. First, the tubes do not draw grid current even at full output. This eliminates the driver transformer with its attendant cost and hum pickup and allows the use of an inexpensive phase inversion circuit to obtain the push-pull voltage on the grids of the output tubes. Second, as the tubes draw almost constant current even at full output, power supply regulation difficulties are minimized. Third, distortion is very much reduced by the fact that no grid current flows at maximum rated output. And lastly, through the use of four tubes instead of two in the output stage, the effective plate resistance of this stage is considerably reduced, thus allowing the amplifier to operate with less distortion as a driver for a high-power class B modulator.

A 6J7 tube connected as a high-gain pentode is used as the voltage amplifier, followed by a 6N7 connected as a phase inverter. This line-up gives the amplifier an overall gain of over 95 db with the gain control in the "wide open" position. This, of course, is more than ample for a diaphragm type crystal or a high output dynamic mike, and enough for close-talking use with a cell type crystal or even a velocity microphone. The input circuit is designed primarily for use with either a cell-type or a diaphragm type crystal microphone. Also, a crystal pickup may be plugged directly into the input jack. Should it be desirable to use some type of mike requiring an input transformer, this transformer can best be placed in a *thoroughly* shielded external box (rotated for minimum hum) and a shielded lead run to the input jack.

The output transformer is one of the new "Multi-Match" jobs that are provided with a plug and jack system whereby almost any output impedance desired may be obtained. The four 6L6G tubes under the conditions of operation used in this amplifier should work into

*Technical Editor, Radio.



a plate-to-plate load of about 4000 ohms. This value of load was found to give the best output consistent with low distortion. The chart that is furnished with the transformer lists a whole series of loads that the transformer will match with any plate-to-plate load on the primary. In this case (with 4000 ohm primary) output can be obtained at most any impedance from 412 to 19,500 ohms. In our particular case the connections are made so that a secondary load of 3240 ohms is obtained. This load very closely matches the pair of 6L6G's used in the final stage of the "Bi-Push" when used as a modulated amplifier.

For these conditions the plates of the four 6L6G's are connected to terminals 1 and 6.

The plate voltage for these tubes is connected to 2 and 5 and these two terminals are of course strapped together. Then, on the secondary, 7 is connected to 11, 8 to 12, and the plate voltage to the modulated amplifier is run into terminal 7 and out to the tubes through terminal 8. These connections will, of course, be different for any other load conditions on the secondary.

The amplifier can be used to feed a 500 ohm line with the secondary connected so as to feed the 412 ohm impedance. The mis-match would not be large enough to cause any difficulty. The tubes would work into a slightly higher load, about 4800 ohms, under these conditions.

By properly connecting the various terminals the output transformer may well be used as a driver transformer for a high-power class B modulator. Four leads should be brought out from the two secondary coils.

As an example, with the 6L6G plates connected to 7 and 12, and the plate voltage fed through 9 and 10, coils 2 to 3 and 4 to 5 could be used to feed the grids of a pair of 805's, 250TH's, 806's, HF200's or similar high-level class B tubes. The grid bias for the tubes would be fed through 3 and 4 and the grids would be connected to terminals 2 and 5.

In addition the amplifier could be used as a high power grid modulator or it could be used to modulate a low level stage when using a high power linear amplifier.

Mechanical Construction

The entire amplifier is built up on 10" by 17" covered steel chassis. Since both the chassis and cover come crackle finished when purchased, it is difficult to obtain a good common ground for the amplifier. To insure that a good ground is obtained for all stages the chassis is not relied upon to furnish any of the return circuits. A lead from the center-tap of the high voltage transformer is run directly to all points where a ground is required. In addition, the chassis is carefully scraped and a lead soldered at this point. In this way the chassis is effectively at ground potential although it is not required to carry any of the return current. An exception to this is made in the case of the four can-type filter condensers that are mounted upon the chassis. These condensers have no grounding lug attached to them; the return must be made to the cans of these condensers. To insure a good connection for this return the chassis is scraped clean where the condensers make connection to the chassis. By bolting them down tightly a good ground is had.

A look at both the top and the under-chassis view will give a good idea as to other constructional details. All the resistors and condensers for the low level stages are supported from a resistor mounting plate located just behind the sockets of the two tubes. All the plate supply equipment is located at the other end of the chassis, thus minimizing coupling between these two units. The two-circuit jack that forms the input of the amplifier is located at the front of the amplifier and in the immediate vicinity of the 6J7 tube whose grid it must feed. Through the use of a closed circuit jack in this position, when the plug at the input of the amplifier is removed the grid of the first tube is grounded; in this way any open-circuit hum pickup is eliminated.

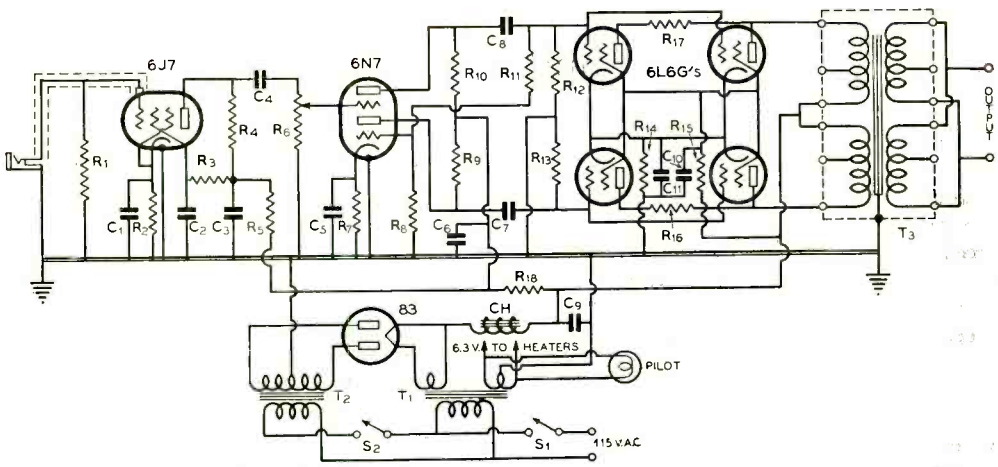
To the right of the input jack is located the volume control between the 6J7 and the input grid of the 6N7 phase inverter. Then at the center of the front panel is placed the pilot light and to the right are the plate and filament control switches.

To the right of the rear panel of the chassis is placed the cord receptacle and to the left, just behind the output transformer, is mounted the terminal strip that carries the output connections of the amplifier.

Circuit Details

The values given in the circuit diagram were found by experimentation to give the best results. Especially is this true of the resistors comprising the phase inverter. The values of the two resistors comprising the voltage return to the second grid of the 6N7 were changed until exactly the same voltage was applied to the grids of each side of the output circuit. If an oscilloscope is available, it is best to measure the voltage applied to each of these grids as manufacturing variations in resistors will sometimes throw this off slightly. However, if a 'scope is not available, the resistor values as marked can be taken as correct.

When the amplifier was first connected up, bad high-frequency parasitics were found in the push-pull-parallel output stage. As a matter of fact they were so bad that before the trouble could be located one of the sockets on the 6L6G tubes was badly charred due to these parasitics. By placing the two 100 ohm parasitic suppressor resistors in series with the plate of the second of each of the paralleled tubes these "bugs" were entirely eliminated.



General Wiring Diagram of the Amplifier-Modulator

(See Note at End of Article)

C_1—25 µfd. 25 volt electrolytic
C_2—0.5—µfd. 400 volt tubular
C_3—16 µfd. 450 volt elect.
C_4—0.1 µfd. 400 volt tubular
C_5—25 µfd. 25 volt elect.
C_6—8 µfd. 450 volt electrolytic
C_7,C_8—0.1 µfd. 400 volts
C_9—16 µufd. 450 volt (two 8 µfd. units in par.)
C_{10}—8 µfd. 450 volt elect.
C_{11}—25 µfd. 25 volt elec.
R_1—5 megohms, ½ watt
R_2—1500 ohms, 1 watt
R_3—1 megohm, 1 watt
R_4—250,000 ohms, 1 watt
R_5—25,000 ohms, 1 watt
R_6—500,000 ohm potentiometer
R_7—1500 ohms, 1 watt
R_8—25,000 ohms, 1 watt
R_9, R_{10}—100,000 ohms, 1 watt
R_{11}—500,000 ohms, 1 watt
R_{12}, R_{13}—200,000 ohms 1 watt
R_{14}—125 ohms, 20 watts
R_{15}—4000 ohms, 10 watts
R_{16}, R_{17}—100 ohms, 5 watts
R_{18}—10,000 ohms, 10 watts
CH—300 ma. swinging choke
T_1—6.3 volts, 6 amps.; 5 volts, 3 amps.
T_2—1050 volts c. t., 250 to 450 ma.
T_3—Universal output transformer
S_1—Filament control switch
S_2—Plate control switch

Through the use of large value by-pass condensers in the de-coupling circuits of the input stages any tendency toward motorboating or hum pickup is eliminated, even with the amplifier at full gain.

As the supply transformers used are equipped with primary taps it is easily possible to compensate for variations in line voltage merely by changing these taps. The tap on the plate transformer is placed on the "110 volt" tap to provide about 440 volts from the filter at the total drain of approximately 270 ma. This would seem to be somewhat of an overload for the single 83 rectifier tube, but through the use of a very husky input choke the peak plate current of the tube is kept below the maximum rated value.

With the resistor values shown the combined drain of the plates and screens of the four 6L6G's is about 260 ma. The two low level stages have a combined additional drain of about 10 ma.

Warning!

Care must be taken in placing the amplifier in operation to allow ample time for the filaments to come to operating temperature before the plate voltage is applied. The switch on the left of the front panel should be closed first to light the filaments of the various tubes. Then after an interval at least 30 seconds, the second switch may be closed to apply the plate voltage. Allowing ample time between the application of the filament and plate voltage will greatly lengthen the life of both the tubes (especially the 83) and the various filter and de-coupling condensers.

Inadvertently omitted from the diagram was a 15,000 ohm 10 watt resistor. It should be connected from the screens of the 6L6's to the *cathodes* (not ground).

◆

Since most hams insist on misusing "QRA" when they really mean "QTH", it might be a good idea to designate a new Q signal for "What is the name of your station?" (the *correct* meaning of "QRA").

◆

Call insignia takes many shapes among hams, but to date we haven't seen a call tattooed on a ham's hide. But then, we don't know many sailors.

Postscripts and Announcements

NOTES ON THE FLAT-TOP BEAM ANTENNA

In addition to the systems shown in the flat-top beam article last month, one may use end feed on a two-section flat-top rather than feed it at the center. Although center feed is, perhaps, preferable due to its symmetry, the end feed may be convenient where the transmitter is near one end of the antenna and short zepp feeders are desired. This also suggests the possibility of using two full-wave horizontal wires with one-eighth wave spacing but no cross-over at the middle. This system would have a field pattern similar to that for a single horizontal full-wave antenna, but with a gain horizontally over the field from the single full-wave. W8WA recommends this arrangement.

When it happens that one has a transmission line which is an even number of eighth wave lengths long, the short-cut method described for locating the position of the transmission line above the short on a matching stub may not give good results. In this case, one can, of course, proceed entirely by measurements along the transmission line and adjust for minimum standing waves. If, however, one knows by previous experience with a properly adjusted transmission line of the same impedance where it should tap on the antenna coil and also the correct final and antenna tank condenser settings for resonance, these settings may be used. The short-cut method (adjusting the line on the stub for maximum current at the short) will then usually be found to give a good match, regardless of line length.

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Erratum

In the article "Semi-Automatic Transmitter Control with Relays" on page 52 of the June issue, there appears an error in figure 1-B. The left side of the 110 volt line should connect *only* to the left terminal of MHR. There should be no connection between this side of the a.c. line and the right hand terminal of the right hand "start" button.

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January Copies

Did you miss out on the January, 1937, special annual issue of RADIO? If so, we now have a few copies which were returned from news stands that are available for a limited time of four weeks to present subscribers at the reduced price of 35c each. After August 1, orders will be filled at 50c each from non-subscribers in the order received.

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Calls Heard Contributions

When sending in lists of calls heard, it is highly desirable that you list the signal strength of each station where possible (R-strength suffix on each call). These signal strength reports make the lists much more valuable.

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Philatelists

RADIO's list of stamp-collecting hams is enlarged by the addition of the following names. If you are philatelic-minded, send us your name and call.

Philip Nicholl, G5ZN, 35 Reedley Road, Burnley, Lancashire, Eng.

Carl Soendlin, W8QQZ, Logan, W. Va.

R. L. Cunningham, VE1AS, 19 Brenton St., Halifax, N. S. Canada (specializes in British Colonies, Dominions, and U. S. A. stamps.)

J. G. Kuespert, W9WCE, 706 29th St., South Bend, Ind. (specializes in U. S. A., Great Britain, British colonies, and each country he works on the air.)

Sidney D. Shaw, W7AOL, Route 6, Salem, Ore.

Jack Cunningham, W5GKI, 204 East Huff Ave., San Antonio, Texas.

Charles Spang, W9UUR, 17 Biehl St., Newport, Ky.

E. L. Hallgren, W9KWZ, Aurora, Ill.

W. E. Altizer, W6MBE, 424 10th St., Antioch, Calif. (specializes in U. S. Bureau prints, Australian, Canadian, Central and South American and British Colonial stamps.)

M. S. Brainard, W7GEQ, Gold Beach, Ore.

W. Briden-Jones, ZL2PN, 11 Nairn St., Wellington, C-2, N. Z.

Others are: W1EN, W2HAE, G2LC, F8NY, ZL2AL, G2IO, ZL2BZ, ZE1JU, VS7RP, VE2DR, W7GEQ, W6MUF, W2AJE, W3FSP, W9SGT, W5EMI, PA0(zero)KZ, PK2DU, ZT5P, VE4MQ.

W6CHU writes that anyone interested can have his name placed on a mailing list in the Los Angeles post office to be notified of new issues and special mailings.

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HAMFESTS AND CONVENTIONS

Pacific Division

Eighteenth Pacific Division A. R. R. L. convention will be held Sept. 4, 5, and 6 in the Civic Auditorium, Stockton, Calif. There will be a radio show in conjunction with the usual convention program. Registration will be handled at Stockton Amateur

Radio Headquarters, Hotel Wolf, Sutter and Market Streets, Stockton. Further information will be given in circular letters sent out at a later date. George R. Scott, W6IKG, is general chairman.

Chicago

Chicago's largest and livest radio club—the Hamfesters—has slated its fourth annual picnic for Aug. 8 in Justice Park Gardens, located at Archer and Kean Avenues.

Hundreds of prizes will be given, with an RME-69 topping the list as grand prize. Games, races, refreshments, and dancing to the strains of Bornemann's Bandits will make up the program. Out-of town hams can secure tickets from Chet T. Horton, W9YQH, 8732 South Laflin Street, Chicago.

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FEEDING THE PUSH BUTTON ANTENNA
With a Concentric Line

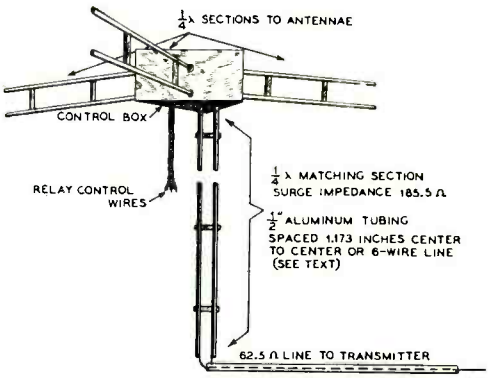
We have received inquiries as to the proper method of matching the "Push-button Controlled Beam" as described in the June issue of RADIO to a concentric transmission line. Since the usual surge impedance of such a line is so far removed from the 550 ohm termination of the system (usually their impedance is in the order of 50 to 75 ohms) an additional matching section is required to negotiate a proper match.

If we take the impedance of such a concentric line as being 62.5 ohms, our problem becomes that of matching an impedance of 62.5 ohms to one of 550 ohms. This match can be accomplished in a number of different ways but by far the simplest one is through the use of a quarter wave matching section. This quarter wave section must have a surge impedance equal to the geometric mean between those impedances it is desired to match. In this case:

$$Z_q = \sqrt{62.5(550)} = 185.5 \text{ ohms}$$

Such an impedance may be obtained through the use of a six-wire spaced line as described by Madsen in RADIO for April, 1937. For this case, six no. 18 wires could be arranged in a circle with a spacing between each wire and the adjacent ones of 3". The diameter of the circle containing the six wires would be 6". Such small wire (no. 18) would be ample to carry any power up to one kw. or more as the wires are paralleled (3 by 3) at each end.

This matching section can also be constructed in the same manner as the conventional Q section. Two ½" diameter aluminum or copper tubes spaced 1.173" center to center will give the desired surge impedance. This center-to-center spacing is obtained with the insides of the two tubes separated slightly more than ⅝".



To answer another question, feeder switching relays suitable for use in the control box of this antenna system (or for feeder switching in any type of antenna arrangement) may be obtained from the Ward Leonard Electric Co. or the Guardian Electric Co.

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TAPE TAGS

The electrical boys at the Douglas Aircraft factory have a neat system for identifying wires. Everyone that has at one time or another puzzled over which wire was which as he looked at a transformer with multileads will be interested.

White adhesive tape as carried by the dime stores will serve the purpose. Cut off a short length from the roll and roll that piece on a typewriter platen. Typing the figures on the adhesive tape makes a neat job or they may be written on in ink. Many different ways of doing this will suggest themselves as the wire size or area to be covered may vary. After typing, place the printed tape on a smooth board, press down firmly, then cut with a sharp knife or razor. In this way a whole string of numbers may be typed at one time and then cut off with the least of trouble.

For a lasting tag that will not easily soil, brush on a little white shellac after the tape has been applied to its place.

This scheme is not limited to wires. Dating vacuum tubes, placing your name on a tool, indicating meter polarity, dial markers, marking plug-in coils, and many other uses can be thought of.

No harm to the typewriter if the pressure rollers are released. This avoids pressing tape too hard against platen.

—W6AVN.

WHERE NEXT?

Some crystal manufacturers keep a complete record of the frequencies of crystal orders, others have a general picture of the *demand*. With the idea that this information would be of interest, we got in touch with several manufacturers.

There are limitations on the use of these data. Many transmitters on 160 meters may not use crystals, and this in part may apply to 80 meters, particularly in the range from 3650 to 3900 kc. Further, a crystal at 3550 might be desired for work on any of a number of bands. A concentration of purchases between 3500 and 3650 kc. properly should be allocated to several bands.

Crystals for 160 meters are mainly for phone. Possibly only 1% are for the code portion and most of those are for spot frequencies, a number being ordered at one time. This tends to confirm the idea that 160 meter code is little used, though there could be much operation of low power self-excited transmitters in this range.

A large part of the crystals sold are for the 80 meter band, while about one-third are now for "40." In this band, about 5% are for 80 meter phone, and a somewhat smaller percentage for the range from 3800 to 3900 kc., which seems relatively to have been neglected, considering that the phones use much more space per channel. This is not news, however, to anyone who has recently listened to this part of the band.

There is a somewhat larger demand for crystals between 3650 and 3800, which also probably can be attributed to 80 meter operation. The real demand, as would be expected, falls between 3500 and 3650, half of it concentrated in the range from 3500 to 3550. Lately there has been a tendency to shift to higher frequencies, a good share of the demand now being for 3600 to 3650, obviously for operation near the high frequency end of the 7 Mc. band.

We raised the question of "edge-of-band" operation and were told that the requests were not for crystals *near*, but *on* the edge. Approximately half of the total demand is for frequencies close to some "edge." One manufacturer suggested that the bands be made star-shaped so that there will be more edges!

This concentration has been particularly noticeable with 20 meter phone, even though there is a question as to the legality of using a carrier frequency so close to the edge (within several kilocycles) that modulation sidebands will reach outside of the limits.

If these figures mean that half of the gang is fighting for edge positions, the other half should be having a good time *working* dx on on clear channels— *if* they can raise 'em!

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20,000 WATTS OF AUDIO

The high powered public address installation made by the Western Electric Company at the Roosevelt Raceway on Long Island will be of interest to the amateurs (especially the high-power gang) from the standpoint of the large proportions of the components. It is easy to imagine the tremendous amount of acoustical power needed to talk down the din made by the speeding race-cars, the screaming and clapping audience, and the blare of auto horns of such as were seated in their automobiles. But this installation was able to put a good understandable signal on voice and good audio quality from a radio or a phonograph over the entire 264 acre tract.

Such is a real accomplishment but the magnitude of the installation would allow one to expect most anything. To eliminate phase lags introduced by a number of speakers spread throughout the field all the thirty-one speakers used were placed on a 100 foot tower somewhere near the center of the track. On the top of this tower were placed the nineteen "Bull Horn" speakers and each was fed by a separate 1000 watt audio amplifier. Then at about the 40 foot level were placed the twelve smaller speakers and the whole twelve of them were operated by another 1000 watt amplifier. The large speakers were used to cover the outlying portions of the field and the smaller ones to cover only the grandstand directly in front of the tower.

These large speakers (Bull Horns) are of unusual interest. They are folded exponential affairs with an electro-dynamic driver unit; total weight about 495 pounds. Considering the comparatively small size of these speakers (32" in diameter, 24" deep) in comparison with conventional p.a. speakers it is really remarkable the tremendous amount of audio power that they will handle. A kw. of audio is quite a large noise when efficiently converted into accoustic watts.

Each of the kw. audio amplifiers uses four WE308-B tubes (low μ 212-E's) in class AB.

Each of these amplifiers is mounted in a large rack with its separate 3-phase power supply.

What a modulator one of those amplifiers would make!

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In the May issue of *The Illinois Guardsman* there was published a comprehensive article on "What About Our Bands". The article discloses an alarming fact: that our bands are faced with practical extinction!

Yes, all the trombone players in the Army and National Guard might have to go back to the line as gun-toting soldiers instead of horn toters.

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After a skidding automobile crashed through a bridge rail in Boston, telephone cables held it suspended until rescuers extricated the driver unhurt. Good wiring!

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W9FWN and W9ESZ have noticed a fluttering of their 10-meter signals only when metal planes of the North West Airlines are flying almost directly over FWN's antenna. They are trying to justify the suggestion of reflection.

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40,000 FRATERNITY BROTHERS

The moral of this little tale is obvious. W9XXX, who wants to be thus unidentified, submitted it along with proof in our recent "Radio Oddity" contest. While it may be an oddity for those outside of hamming, for those who know all the handgrips and passwords of an amazingly fraternal brotherhood, it's sufficient to start us "remembering when." Like all yarns involving personal experiences, it makes good reading. Of course, if your eyebrows remain aloft in skepticism, you've yet to enjoy all aspects of hamming.—EDITOR.

* * *

Not so long ago, my friend W9ZZZ and I stood admiring the 852's and other high-power bottles in the showcase of a local radio supply house. We were thinking how much better it would be if those "ether busters" were adorning our racks at home rather than laying idle in the store. Too, it would be nice to rub elbows on even terms with some of the "California Kilowatts".

But—there was one difficulty: our pocketbooks were unhappily thin.

With the seeds of desire thus planted, it wasn't at all surprising that when we heard there was a shortage of help in the harvest fields, we packed our toothbrushes, shaving mug, and bottle opener and prepared to head for the open spaces. Then, we encountered a problem: how to get to one of these farms with the minimum of expense and effort.

"Hitch-hiking," I thought, "is a slick method."

But, Friend W9ZZZ held out for the side-door pullman. Rather than argue, I let him have his way. By night, we were safely out of town and lying on the tender behind the engineer's cab. It wasn't long before a couple of knights of the road swung up beside us. Judging from their dusky appearances, I believed that "we all was headin' for the Southland."

Nightfall found us in Central Wisconsin and on the wrong train. I have ridden on everything from "kiddie cars" to airliners, but no equipage ever offered the variety in jolts and pinches delivered by our chariot, a flat car piled high with telephone poles. Somehow, we landed in Milwaukee, a nice town. We hadn't been there long, however, before we found ourselves riding between two burlies in a new type carriage, the "Black Maria."

"Are you married or single? Where are you going? Where are you from?" and so on, ad infinitum. If this was just the ordinary run of questioning, I'd certainly hate to undergo a third degree!

The captain looked us over and finally said, "Well, sorry, boys; I'm afraid you'll have to be our guest for a few days."

"Come on Paul," I said to myself. "Are you, or aren't you, John Dillinger?" At the same time, I pinched myself to see if I were really awake.

About this time, my silent partner, W9ZZZ, pipes up, "Say, haven't they got a police radio in this town?"

"Some pal . . . . thinking about radio at a time like this," I sourly philosophized.

Suddenly, the ol' brain clicked and I said to the officer, "I know the radio operator here. If you'll let me see him, I'm sure everything can be explained satisfactorily."

The man in charge was hesitant; then "O. K." says he.

When the radio operator came in, the officer remarked, "We've got a couple of your pals who are going to be put away for a few days while we investigate."

About that time, I made a chain-lightning dive into my pocket, pulled out my ham ticket, and vigorously pumped the arm of a somewhat startled radio op.

"I'm W9XXX from Minneapolis; haven't I worked you before?" I yelled.

Yep—you guessed it, and it was a good guess on my part, too. He was a ham. A bit of rag-chewing with him, a few words to the captain, and a glance at the licenses to prove our identity, and two W9's from Minneapolis were soon en route home.

So now, when spring and the urge to travel come, I think of Milwaukee and that maybe the next radio op may not be a ham.

All of which goes to show that from making friends to being the "open, sesame" of a prison's gates, there is nothing quite like a ham ticket!

OPEN FORUM

[Continued from Page 9]

under all of the conditions which have been imposed on the hams—and no nitwit can ever convince me that *operating conditions* in our present restricted bands are *better* than conditions were in 1920 or 1925!

After the pioneering in short wave in 1923, the number of stations on c.w. greatly increased and we did have QRM—but there were less than half as many hams and several times as many frequencies as there are today and these frequencies were free of the "V" wheels which infest them now.

It is true that equipment is far ahead of what it was then—it has to be to get through nowadays!

With equipment as it now is, what possible excuse can there be for some of the r.a.c. notes and frequency wobbles of poorly filtered and overloaded self-oscillators of the t.n.t. variety?

A few years ago a person could drive almost any kind of "jelopie" car on the highway and get away with it because there were fewer cars and he didn't jeopardize the safety or trespass on the rights of so many people. Today, states all over the country are legislating the "jelopie" car off the highway in order to protect the rights and safety of the people who travel the highways with proper equipment to suit advanced conditions.

There is no more excuse for the "jelopie" transmitter on the ham bands today than there is for the "jelopie" car on the highway. We need "highway patrolmen" for the ham bands. I suggest a fee of $2.50 a year for powers up to 250 watts, a limit of 500 watts (input!) and an increased fee of 1c for every watt over 250. I think that limit could be reduced to good advantage to a maximum power of not over 250 watts.

I have no quarrel with fone, if the fone stays where it is supposed to stay. I have my own transmitter equipped for modulation, but seldom use it except on u.h.f.

To consider fone impartially, it takes the equivalent of ten c.w. channels for each fone (assuming sidebands of 5 kc. either side of the carrier) and therefore not more than 1/10 of each band should be devoted to fone.

More important would be a re-allocation of fone in bands hearing a definite harmonic relationship to each other, so their R5 and 6 second harmonics will not occupy space alloted to other services.

Stringent enforcement of regulations regarding emission of harmonics should be required and tickets of violators suspended or revoked, in case of flagrant and repeated violations. There is not a night when I cannot pick up strong harmonics of 160 meter fones in the 3600 to 3900 kc. c.w. band, and I have a modern receiver.

The fellow who buys a 3900 kc. or 4000 kc. crystal smugly thinks he is in the band, but disregards the 5 kc. (if he has decent fidelity) slop-over of his side bands, which places 50 per cent of his transmission outside the fone band.

Equally pernicious are the hams who listen for ham signals and then tune their c.w. transmitters outside the U. S. allocations because they hear hams (of other nationalities) there.

We could go on and name a half dozen pet "peeves", but still get nowhere—it has all been seen in print so many times.

The point is that something can, and must, be done about it, to relieve the intolerable conditions now present in our bands.

We, as hams, are reluctant to report violations of regulations by other hams. Therefore, the answer is an adequate staff of government monitors.

This means money, which can be raised only by a tax of some kind—but wouldn't it be worth it, to eliminate the selfish signals of all kinds and the rotten operating practices? I ask you?

E. M. LINK, W9OHA.

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LEAGUE LAMENT

Wood River, Ill.

Sirs:

To start with, this letter is written in answer to some literature handed to and read by the president of the Piasa Amateur Radio Club of Wood River during a regular meeting in Alton, Ill. It is not intended to "razz" anyone, but it will, on the other hand, criticize things, methods, and persons.

In the literature read at the meeting was a petition to be signed by A. R. R. L. members who were asked if they wished to have a vote or referendum on questions of great importance to the amateur. If the petition were passed, the League would be governed accordingly in its actions by the votes cast. Should this pro-

[Continued on Page 82]

RCA's 100 Mc. Communication Link*

Several of our readers have raised questions about the 100 Mc. equipment used by R. C. A. in its New York - Philadelphia circuit, mentioned in a recent issue.

It was decided to use frequencies above 85 Mc. to avoid contact with probable future television assignments, even though these high frequencies attenuate very rapidly beyond the horizon compared with the 25 to 60 Mc. range.

A survey indicated that two relay points were necessary, these being selected so that the jumps are 25, 36 and 30 miles, the shorter jumps at the ends being required in order to lay down a strong enough signal in New York and Philadelphia to ride well above the high noise level experienced in urban areas.

The receivers were specially designed to meet an allocation plan to permit wide extension of the system. Triple detection receivers were used with a first intermediate frequency of 30 Mc. and a second i.f. of 5.5 Mc. These were chosen so as to avoid spurious response at the frequencies appearing in the allocation plan. These spurious response points might be expected to occur at 4.5, 5, and 10 Mc. below, and at 4.5, 5, 10, 14 and 14.5 above, the received frequency. Triple detection was used in order to provide high discrimination against image response while at the same time providing adequate adjacent channel selectivity with reasonable provision for frequency drift. The frequency drift of the high frequency oscillator was controlled to close limits by utilizing the stabilizing characteristics of an adjustable low power factor resonator. Low power factor resonators were also utilized in the high frequency pre-selection circuits of the receiver. The receivers are provided with flat automatic gain control so that the receiver output delivered to the transmitter modulator is held within close limits in spite of possible variations of the received signal due to fading, weather conditions, or variation in the transmitter power.

The input to the receivers enters through a transmission line. Two horizontal pipes contain the low power factor resonators for providing r.f. selectivity. These enter a large box in which is the low power factor resonator controlling the h.f. oscillator, the frequency of which is varied by screwing a plate in and out, varying the loading capacity of the resonator.

The oscillator utilizes an RCA 955 "Acorn" triode[1] which is contained in the casing of the resonator. RCA 954 tetrodes are used in the 30 Mc. amplifier.

The frequency of the transmitters is held to close limits by resonant line circuits of the temperature controlled type[2]. The master oscillator consists of two RCA 834 triodes which drive four RCA 834 triodes in the power amplifier. The maximum carrier power is approximately 100 watts but ordinarily the transmitters are operated at about half power to increase the reliability of the transmitters at unattended stations.

The resonant line control, master oscillator and power amplifier are located in a circular tank-like structure out of which runs the transmission line to the antenna.

Directive transmitting and receiving antennas are used. The transmitting antennas utilize a vertical array of *horizontal* dipoles with a similar array a quarter wave behind for a reflector. The horizontal dipoles are approximately half a wavelength long and are spaced vertically half a wavelength. No insulators are used to support the dipoles, as they can be conductively connected to the supporting structure because the center of the dipole is at zero r.f. potential. The transmission line is reversed at alternate dipoles to allow for the 180 degree phase reversal in a half wave section of the line, thereby forcing all of the dipoles in the antenna to oscillate in phase. The reflector is connected in the same manner.

The receiving antenna at New York, on the roof of the City Bank-Farmer's Trust Building, is a duplicate of the transmitting antennas.

The gain of the antennas using four dipoles with an equal number of reflectors, is about 10 db. At the relay points, the antennas are mounted on towers and seven dipoles are stacked vertically instead of four, so the gain is correspondingly greater.

[*Continued on Page 32*]

* A description of this system was contained in the *RCA Review* for July, 1936.

[1] "Vacuum Tubes of Small Dimensions for Use at Extremely High Frequencies," B. J. Thompson and G. M. Rose, Jr., *Proc. I.R.E.*, December, 1933.

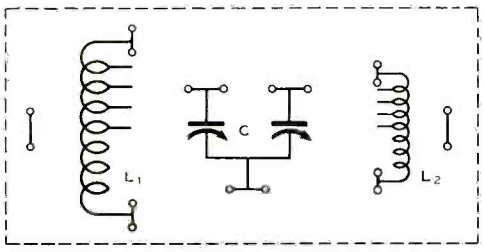
[2] "Frequency Control by Low Power Factor Line Circuits," C. W. Hansell and P. S. Carter, *Proc. I.R.E.*, April, 1936.

The Simplest Universal Antenna Coupler

By W. W. SMITH,* W6BCX

A surprising number of things can be done with a tapped coil and variable condenser; antenna coupling and tuning for instance. The combination when built up to enable different methods of connection makes a unit that is surpassed in its utility only by its versatility.

Just what does an amateur mean when he speaks of "matching" his feeders to his transmitter? There is really nothing to "match"; he simply uses the term to signify the loading of the final stage to the plate current he desires to run. Actually all the matching and mismatching we worry about pertains to the junction of the feeders and *antenna*. In fact, if we



Circuit diagram of the coupler. For constants see text.

are using either an antenna with tuned feeders, a Marconi, or an antenna counterpoise system, we need not worry at all about "impedance mismatch." All we need be concerned about are loading adjustment and harmonic suppression. And with untuned feeders we need be concerned with only the same two things, *provided* of course that the untuned line is properly terminated (at the antenna end).

What it boils down to is the fact that if we are using an untuned line and it is properly terminated, we can clip right on the tank coil with the feeders and adjust the loading by sliding the feeders up and down the coil. A tank circuit consisting merely of a coil and condenser can be used for harmonic suppression by connecting it as shown in "A". This can be used with either a 72 ohm line or a 300-500 ohm open line, and should preferably be placed near the transmitter rather than across the room.

When using tuned feeders, and no attempt is made to remove standing waves from the feed line, the only consideration is that the system as a whole (antenna and feeders) be resonant, so that it does not present a reactive load. This can be done by cutting the tuned feeders to exactly the right length for the particular operating frequency and radiator used. However, as we usually like to be able to jump around in the band, and sometimes from band to band, some means of adjusting electrically the resonant frequency is desirable. This can be done by inserting a variable (tapped) inductance, a variable condenser, or preferably a combination of both. With the latter combination it is possible to resonate almost any conceivable form of radiator and tuned-feed system.

Loading, Not Matching

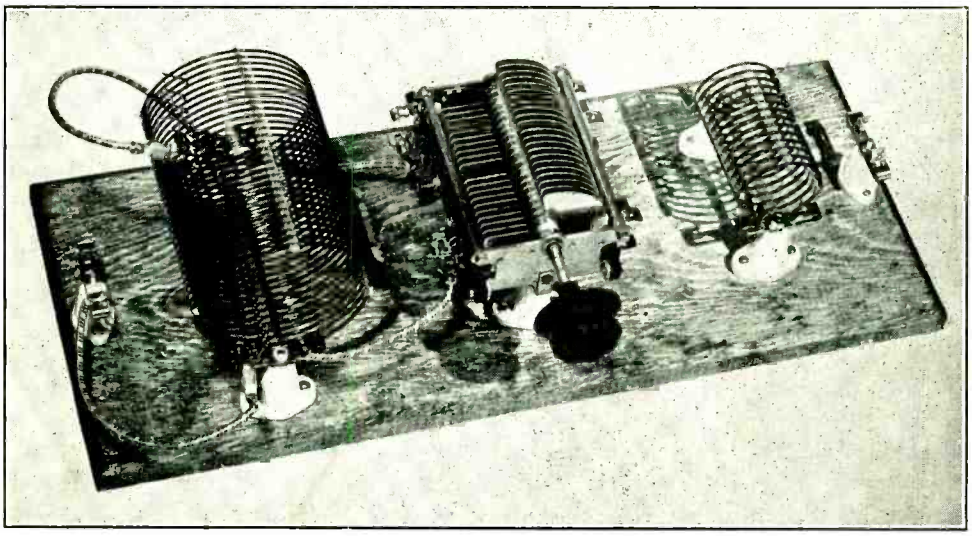
Other than resonating the tuned-feeder antenna system so that it will not present a reactive load, the only thing requiring adjustment is the loading of the final amplifier to the proper plate input. This should *not* be done by detuning the antenna system, but rather by adjusting the coupling. This is very simple, and will be dealt with later.

The Inductor

The variable inductance used as part of the tuning apparatus for the antenna system utilizing tuned feeders can be used as a means of inductive pickup for the feeders. Instead of ever shorting out the inductance altogether, three or four turns are always left in the circuit and the inductance introduced by these turns compensated for by using slightly less capacity on the series condenser. Thus there will always be at least a few turns of the coil which can be used for the purpose of coupling the feeders inductively to the final amplifier.

This variable inductance can consist of a large coil with taps every few turns so that the turns may be shorted out. There is no necessity for making the inductance continuously variable because fine adjustment can be made with the variable condenser. All that is required is that we can adjust the inductance in small enough jumps that the condenser can be made to "hit" any desired frequency with any combination of feeders and radiator. By using a large coil tapped every two turns or so and a

* Editor, RADIO



The "Simplex" antenna coupler. It has an infinite number of uses, and is inexpensive to construct.

variable condenser of 350 to 500 μμfd. maximum capacity, it is possible to resonate almost any antenna system, if not series tuned then by parallel tuning the feeders and coil.

The coil need be tapped only from the center to one end, because by making provision for shorting turns from *either end* of the coil, any number of turns from zero up to the number of the coil can be shorted in progressive steps of two. This saves the work of tapping the whole coil.

Because it is not particularly desirable to short out more than about 3/4 of a coil, it is best also to have a smaller coil, smaller in diameter and with fewer turns, tapped from the center to one end in the same manner as the large coil, that can be used for the smaller values of inductance. In other words, when it becomes necessary to short out too much of the large coil, use the small coil instead.

The Condenser

While the condenser can be a single section type, a dual section (split stator) condenser is somewhat more useful. Both minimum capacity and voltage breakdown can be increased by using the sections in series (at a sacrifice in maximum capacity). This works out very nicely because it is at the smaller values of capacity where the condenser will tend to flash across. There is a larger r. f. potential across the condenser at high values of reactance (low capacity). Thus, all we have to do is to use the series connection for small values of capacity in order to avoid flashover. A split stator condenser is desirable also for the reason that it is better adapted for use in circuits "A", "D", and "I" in the accompanying diagram. Besides, a dual condenser costs but little more than a single section condenser of the same number of plates and of the same plate spacing.

Link Coupling

Now it would be rather awkward to place the tapped inductor in inductive relation to the final tank coil, and even more so to make the coupling adjustable. This can be dispensed with, and several incidental advantages provided, by using link coupling with a twisted, low impedance line between the final tank coil and the antenna inductor. The link on the antenna inductor can consist of two or three turns semi-permanently placed inside the coil, and coupling adjustments made by means of varying the number of turns or position of the pick-up loop at the *transmitter* end of the twisted pair.

By using link coupling and grounding one side of the link (either directly or through a mica condenser) capacity coupling between the transmitter and antenna will effectively be eliminated and the even harmonics greatly attenuated. The link coupling will also greatly reduce any tendency for interaction between the antenna tuning and the tuning of the final amplifier tank condenser, a sometimes annoying condition when direct inductive coupling is used.

Incidentally, the twisted line (if more than a couple of feet long) should preferably consist of regular 72 ohm transmission line cable. The losses in twisted lamp cord, especially at the higher frequencies, are quite high when a line of any length is used.

One Is Sufficient

Someone is now going to step up and inquire, "How about a zepp? It takes two condensers to balance the current in the feeders, one condenser in each feeder." This is a common misconception regarding the zepp type end-fed antenna. Balancing the feeders with tuning condensers for equal currents is useless anyhow, inasmuch as the feeders on an end fed zepp can never be balanced for *both* current *and* phase, because of the "dead" feeder. The condition will be most nearly met when the flat top is of the correct length, and if the flat top is of the correct length no juggling of the individual feeders is required. *One* tuning condenser in *one* of the feeders is all that is required; it will not unbalance the system any more than it is already unbalanced as a result of having one dead feeder, and a condenser in each feeder does nothing to "restore the balance" of a system that is inherently unbalanced as a whole.

It is impossible to remove completely all radiation from the feeders of an end-fed zepp antenna. Fortunately this is of no great importance. For the reason that it is of no particular disadvantage to allow the feeders to do a *little* radiating on their own, and because some feeder radiation will be present regardless, the zepp antenna system may be operated over a range of about 5 per cent each side of the resonant frequency of the flat top radiator. The only requirement is that the system as a whole, feeders *and* flat top, be resonant at the operating frequency. And a *single* condenser is all that is required for tuning the system to resonance.

A doublet with spaced feeders, sometimes called a "center fed zepp", is an inherently balanced system (if the two legs of the radiator are exactly equal electrically) and there will be no radiation from the feeders regardless of what frequency the system is operated on. And in this case too, a series condenser may be put in *one* feeder without affecting the balance of the system. The system can successfully be operated on most any frequency if the system as a whole can be resonated to the operating frequency. This is usually possible with a tapped coil and a tuning condenser that can optionally be placed either across the coil or in series with it.

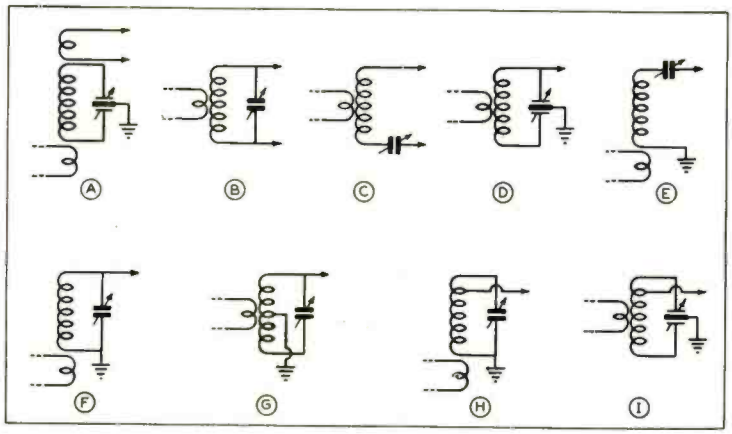
Let's Build One

Now that we have seen how many things can be done with a tapped coil and a variable condenser, let's see about building up an antenna coupling or tuning unit using only these two components. A coupler using these components and possessing the features described is shown in the photograph and in the wiring diagram. It will handle up to 100 watts on phone or 150 watts on c.w. on any band from 10 to 160 meters without fireworks, and for certain applications will handle many times this power. In spite of its simplicity it will "couple most anything to most anything". The split stator condenser, possessing 215 μμfd. per section and 3500 volt spacing, represents less than $5.00. The coils can be homemade if desired. In fact the whole coupler can be constructed for about $6.50 including all materials, though this will run a bit higher if you prefer to buy your coils ready made.

Though we have mentioned but one coil while describing the applications, actually two are used for reasons already mentioned. Rather than short out too much of the large coil, we put the smaller coil into service. In fact, the two coils can even be used together, in series, should the large coil alone ever lack sufficient inductance for any purpose. However, for every common application the large coil alone should possess sufficient inductance.

To facilitate connecting the coil and condenser combination in the many different ways shown, 12 large size dual Fahenstock connectors are mounted on the coils and condenser terminals and generously scattered around as shown in the photograph. Two are mounted on standoff insulators to act as terminals for ground, antenna, or other wires. A dozen lengths of heavy flexible wire of random lengths between 6 and 18 inches enable one to connect up the components in an almost infinite variety of combinations. Low voltage auto ignition cable or heavy flexible hookup wire will do nicely. Soldering the ends of the stranded wire to keep them from becoming "frazzled" is a refinement that takes but a moment.

Because under certain conditions and in certain uses both rotor and stator will be "hot" with r.f., an insulated extension is provided for the condenser shaft in order to remove the dial from the condenser by a few inches. This effectively reduces body capacity under these



conditions to a degree where it is not annoying, even though still present. It also precludes the possibility of getting "bit" from the dial set-screw.

Now to cover some of the things we can do with this simple contraption:

At "A" the unit is used as a harmonic suppression tank as advocated and described by Dawley on page 18 of the April, 1937 issue of RADIO.

Combination "B" may be used for either an end-fed or center-fed zepp that requires "parallel tuning". It may also be used to feed an untuned open line, providing harmonic suppression. It may be used to tune an antenna-counterpoise system that has a higher natural frequency than that upon which it is desired to operate. It may be used with a "Multiband" (Collins) antenna system where the feeders are too short. It may be used with any system utilizing tuned feeders where the system cannot be resonated with series tuning (shown at "C").

Combination "C" may be used for either an end-fed or center-fed zepp that requires "series tuning". It may be used to feed an antenna counterpoise system that is too long electrically to resonate at the operating frequency at its natural period. It may be used with a "Multiband" antenna where the feeders are too long. It may be used for most any system utilizing tuned feeders where the system cannot be resonated using "B".

Arrangement "D" may be used for feeding an end-fed antenna (even number of quarter waves long). It is usually preferable to "F", which is sometimes used for the same purpose. System "F" also is used to tune a Marconi that is slightly shorter than an odd number of quarter waves long.

System "E" is the common method for tuning a Marconi, where the antenna is slightly longer than an odd number of quarter waves.

"G" is commonly used to end-feed an antenna an even number of quarter waves long. It is a variation of "D".

"H" and "I" are used for feeding either a single-wire-fed antenna or for end-feeding a very long wire antenna (6 or more wave-lengths long). For the latter purpose these are preferable to "D", "F", and "G".

In each case the link is coupled around the coil being used and one side of the twisted pair feeding the link is grounded.

Coil Dimensions

The large coil consists of 30 turns of number 12 wire, 4 inches in diameter and spaced to occupy 5¾ inches of winding space. The small coil consists of 14 turns 2 inches in diameter, spaced to occupy 3¼ inches of winding space. Both coils have "tags" brought out every other turn from one end to the center to facilitate clipping to the coils. A copper or brass clip is preferable to a steel clip for shorting out turns, as the circulating current may be quite high under certain conditions.

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New 2 Inch C-R Tube

The new 2-inch high vacuum cathode-ray tube announced recently should enjoy widespread popularity among amateurs. The tube uses electrostatic deflection with the four plates arranged in a manner similar to that used in the 913. As a matter of fact, due to the similarity in filament voltage rating (6.3 volts) and through the use of an octal socket the tube is practically interchangeable with the smaller tube. The high-voltage anode rating is 300 to 600 volts, which makes the tube easy to supply from conventional receiver-type power supplies. Since doubling the screen diameter multiplies the effective area by four, the tube becomes very much worth the slight additional investment over the 913.

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One mag already has hams gone from radio altogether. In a dial chart of the spectrum from 150 to 70,000 kc., amateurs are not shown anywhere among the various services.

Five Meters Goes to Town

By E. H. Conklin, W9FM

Did G5XP Come Back to W1JQA, W1GUY and W1JIS?

For the fourth consecutive spring we are reporting 56 Mc. dx over a 1000 mile path. Because of the quality of the transmitters, fading, and hurried signing, some of the calls reported to us are subject to error, but many definitely have been confirmed from both ends.

On the evening of May 14, local contacts on five meters were interrupted by loud signals from distant points. W1JQA in Randolph, Mass., heard W9FP and W9UAQ of Chicago and also mentions W9URQ who is listed as being in Watertown, So. Dakota. He was unsuccessful in making contact but heard both ends of a five minute QSO between W1JQJ and W9FP. The latter mentioned having heard a station in Springfield, Mass., without getting the call letters. The band closed down at 10:45.

Between 7:04 and 8:45, Joe Hanley of W9YSV in Chicago heard W1JLK, W1IUQ[2], W1GEY, W1JQJ[1], W1IXA[2], and W2FGY[3]. Joe says that fading was rapid, conditions not being as good as on May 9, 1936 when he heard 33 stations.

W9UAQ of Chicago with close to a kilowatt of crystal controlled in contrast to the low power self-excited rigs of several of the others, worked W1GUY[1] and W1JQJ. He did little listening because of the desire to make contacts, but heard several other stations. Subsequently, he received twelve cards from various Massachusetts stations reporting reception of his signals, including cards from W1JBF, W1JQA, and W1VL.

Fred Babineau, W1GUY in Springfield, Mass., at about 8:30 heard W9WLX (Newport, Ky) calling "QST 56 Mc." but was not successful in completing a contact. At 9:30 he called and raised W9FP for a good QSO. The locals were causing plenty of QRM by 10:00 when W9UAQ[1] was raised. A W6 also was reported by W1GUY but the call letters were not copied.

W1IXA who was reported by W9YSV, also received a "heard" card from W9ZEO. Local stations in Malden, Mass., confirmed the fact that the band had been open at that time, but W1IXA wasn't on. Probably a case of mistaking a call, or a bit of bootlegging.

R. Megrue who operates W9WLX at Fort Thomas, Ky., mentions working eastern stations on May 13 between 8:00 and 9:00 p.m. Eastern time, though this date may be the 14th when he was heard by W1GUY. A number of these proved to be unlicensed, but the following were authentic: W1ICI, W2ITU, W1KGY, W1KBM, W1IGY. All were QSA5, R8 to 9 on a Jones superheterodyne using a type 954 first detector. The transmitter was a long lines oscillator with a pair of 210's. He was in on the dx last year, too.

Band Opens Again May 15

The very next morning, May 15 at 11:25 a.m. Eastern time, W8QDD in Dayton, Ohio, heard W1JQA[1] and W1DHO[3] (W1JQA says that this call is W1DZO who was on i.c.w. at the time).

W1JIS heard W8QDD[1] at the same time, also reporting W9UAQ[1] and W9CLH[1] (Elgin, Illinois, with about 500 watts output). W8QDD with only a pair of 45's was as loud as the others—possibly due to being more favored by the skip, which usually doesn't permit signals from as great a range of distance to be received at one time. W1JIS also mentioned having heard a W9 on July 27, 1936, at noon.

W1GUY at 11:30 a.m. heard two W8's, two W9's and one W6 without getting any of the call letters due to bad fading that usually knocked out the call after the district numeral. Very likely, these included W8QDD, W9CLH and W9UAQ. W1GUY says that during 1937 he has heard a lot of dx, including the 9th district and a few foreigners. We are writing for further details.

W9UAQ received a card from W1ESI as well as from W1JIS reporting reception at 12:30 p.m. Eastern time.

At 11:45 a.m. W1JQA heard W9CLH without making contact, then worked W9PPB[1] in Kokomo, Indiana, for a six minute 100% contact. Shortly after, W8QDD[1] came through calling him but at the same time "W8RLS" in Cincinnati also called and was worked for five

[1] Confirmed report.
[2] Station not on 56 Mc. at the time.
[3] Call not listed in call book—probably mistaken identity or bootleg.

minutes. This latter was an unlicensed station, but said that when he heard a first district station come through he took a chance, not thinking that he would be heard! W1JQA received a SWL card from Jack Wood of Indianapolis, Indiana, who was using a single type 53 tube in his receiver.

Three Stations Report G5XP

We have saved for the last the report of hearing—and possibly working—a station signing G5XP. We have no verification from England as yet, but here is the story.

On May 22 at 12:50 a.m., W1JQA heard G5XP of Lancastershire, England, on about 58 Mc. testing and calling CQ on c. w. W1JQA called and believed that he came back but by then receiver interference blotted him out. W1JIS was also heard calling the G.

W1JIS says that he heard G5XP on i. c. w. about 1:00 a. m. daylight saving time, QSA5 R5-6 at first but fading rapidly. He came through for only 15 or 20 minutes. W1JIS believes that the G answered on phone but he could not be sure.

W1GUY writes that at 1:00 a.m. he heard G5XP work W1JQA, signals very weak, about R2 to 3 with fading quite bad. After a call, the signal dropped to R1 and it was impossible to determine to whom he was replying. Additional calls until 2:30 a.m. brought no further response.

The weak, fading signals correspond with what we should expect of this type dx. It might not be unusual for three stations at Springfield, Rockland and Randolph, Mass., to be the ones to hear him. The thing that bothers us is the time—early morning over the whole Atlantic path when not even a report of 28 Mc. reception has ever reached us.

Is It the "E" Layer?

We wrote to the National Bureau of Standards in Washington for data on the ionosphere for May 14 and 15. The reply states that in the past, a few scattered reports of long distance transmission on 56 Mc. have been interpreted as being propagation by way of the "Sporadic E" layer. The ionosphere measurements of the Bureau on the evening of May 14 indicated strong "Sporadic E" reflections at normal incidence up to 11 or 12 Mc.—which is sufficient to account for the 56 Mc. communication on that evening. The records for May 15 had not been developed at the time of the Bureau's letter.

The Bureau will be glad to receive further reports of 56 Mc. transmission over long distances at any time of the year and 28 Mc. transmission during the summer.

It is difficult in the extreme to predict what can next be done on 56 Mc. There is a feeling that there is a charm in the month of May over the Chicago-New England path but five meter dx as far back as 1934 as often as not took place in June and July. Over longer paths, the winter has been as favorable as any other time of the year.

Because there is a "second skip zone", not usually encountered on lower frequency bands except for 28 Mc. during the summer, the area from which a signal might be heard is relatively small. This was the case in 1934 on 28 Mc. The band might often be open if there were signals to hear located at the favorable spot. A considerable amount of data might be gathered if a number of automatically keyed i. c. w. stations are put on the air continuously. The next few years should be used to add to our knowledge of what can be done with our higher frequency bands.

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What, No Ground Wave?

For many years radio engineers, hams, etc., have accepted the conception that there was radiated by a vertical radiator and to a less extent by a horizontal radiator a certain component called the "ground wave" or the "surface ray." This ray was thought to be guided by the earth in the same manner that a wave is guided by a pair of wires. Recent investigation by C. R. Burrows of the Bell Telephone Laboratories has proved this assumption to be incorrect.

Since transmission of this so-called surface ray would be best over a good dielectric, Mr. Burrows performed his experiments over a very deep lake of fresh water, Seneca Lake in New York. The receiver was installed in a small power boat and the transmitter was towed behind at varying distances. In addition, curves were plotted across the lake at greater distances.

The results of the experiment were in very good agreement with Weyl's formula, which has no term that corresponds to the surface wave. The experimentally determined values were very much smaller than the values that would be predicted through the use of Sommerfeld's formula (which includes the surface wave). This changes the concept of radiation as obtained from certain types of radiators frequently used by the amateur fraternity.

Making Life More Simple

By F. Alton Everest*

Graphical class C amplifier design and calculation is a very simple process when one familiarizes himself with the interpretation and application of constant current charts. This method of presenting tube characteristics is extremely useful, and should be encouraged.

While the constant current type of curve has been used in other ways, its application to vacuum tube characteristics is a relatively new one. Their use was first suggested by Mouromtseff and Kozanowski**. To the writer's knowledge, however, the Eimac people are the only ones who supply constant current charts for amateur transmitting tubes. Curves for the Eimac 50-T and 150-T are reproduced in figures 4 and 5. Figures 1, 2, and 3, showing constant current charts for the Heintz and Kaufman 154 and 354, and the RCA 801 were drawn by points transferred from the conventional E_g-I_g and E_p-I_p characteristics. The process of re-plotting is a relatively simple one which any amateur can do for his favorite final amplifier tube. Ordinary graph paper having 20 divisions to the inch is particularly well suited. The curves shown in figures 1 to 5 may be used as a guide in the selection of suitable scales for each square in these figures was half inch on a side before reduction.

Advantages of Constant Current Curves

The chief advantages of using this form of tube characteristic are:

1—The grid and plate characteristics are shown plotted on the same set of coordinates.

2—Operating with a given plate voltage and bias places the operating point in a definite location on the chart.

3—The dynamic characteristic is a straight line drawn through this operating point for any mode of operation, class A, B, or C.

4—With a moderate familiarity with these charts, it is possible to determine the adaptability of a particular tube to a particular function.

5—The μ of the tube is indicated by the slope of the lines. The higher the μ of the tube the more nearly horizontal are the lines. (*Caution*—before comparing the μ of several tubes this way, be sure to bear in mind the fact that a difference of scales will also cause a shift in slope.)

*Instructor in Electrical Engineering, Oregon State College.

** "Vacuum Tubes as Class-C Amplifiers," *Proc. I. R. E.*, July, 1935.

Graphical Class-C Amplifier Design

As a means of illustrating the flexibility of these charts, a complete class C amplifier design for one set of conditions will be shown. Class A and B amplifier analyses follow very closely except for the location and length of dynamic characteristic.

The Gammatron 154 will be used for illustration, with 1000 volts on the plate. The bias required will depend upon the use, varying from 1½ times to several times cutoff. The greater the bias, the higher the efficiency, but the greater the driving voltage required. Let us select the 1½ times cutoff point. At 1000 plate volts (see figure 1) the cutoff point is –200 volts, placing the 1½ times cutoff point at –300 volts. One end of the dynamic characteristic will then be at $E_p = 1000$ and $E_g = -300$ volts, or point C on figure 1.

The extent to which we drive the grid positive is limited (for c.w. or plate modulation) only by the emission of the filament. The total emission current (plate current plus grid current) should never exceed the safe filament emission, which is normally about 30 to 50 ma. per watt of filament heating power for thoriated tungsten filaments. For the 154 the filament heating power is 5 volts × 6.5 amperes or 32.5 watts. As it is a thoriated tungsten filament the maximum instantaneous space current allowable would be in the order of 1000 ma. To be considerate of the tube let us set our upper limit where the sum of plate and grid currents is about 750 ma.

Another factor to remember in locating this positive grid swing point is that of minimum plate voltage. The grid should never become more positive than the plate or the plate current would be diverted to the grid, probably causing damage. With these two factors in mind, let us locate the other end of our dynamic characteristic at point D, where minimum plate voltage (E_{min}) and positive grid voltage (E_{max}) are equal to 150 volts, and where the total space current is about 750 ma. The dynamic characteristic is now completed by drawing a straight line between points C and D.

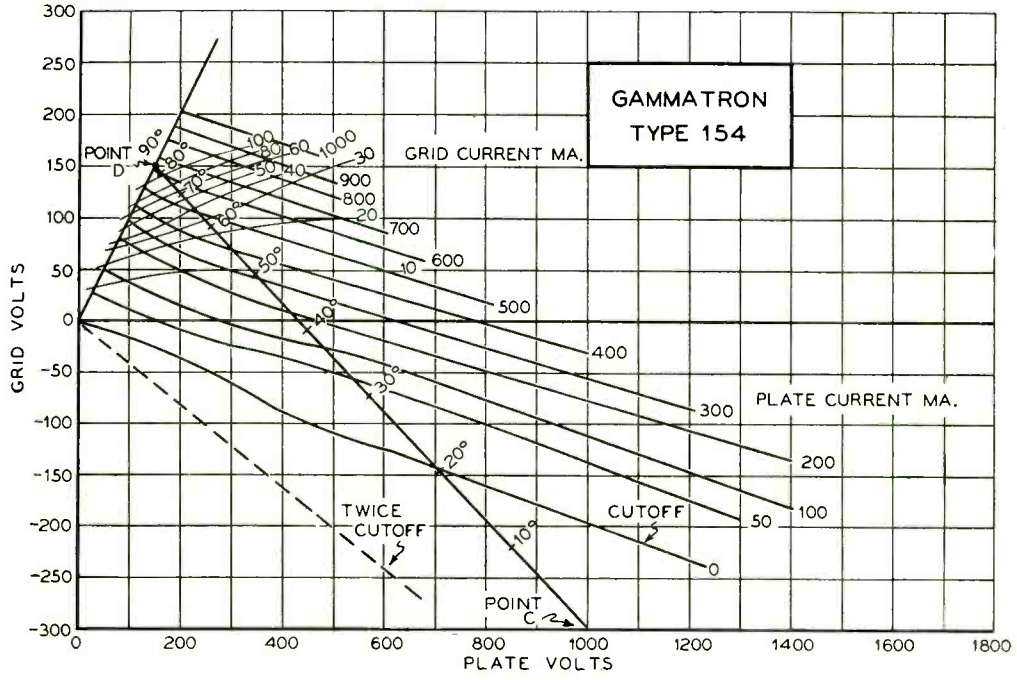


FIGURE 1

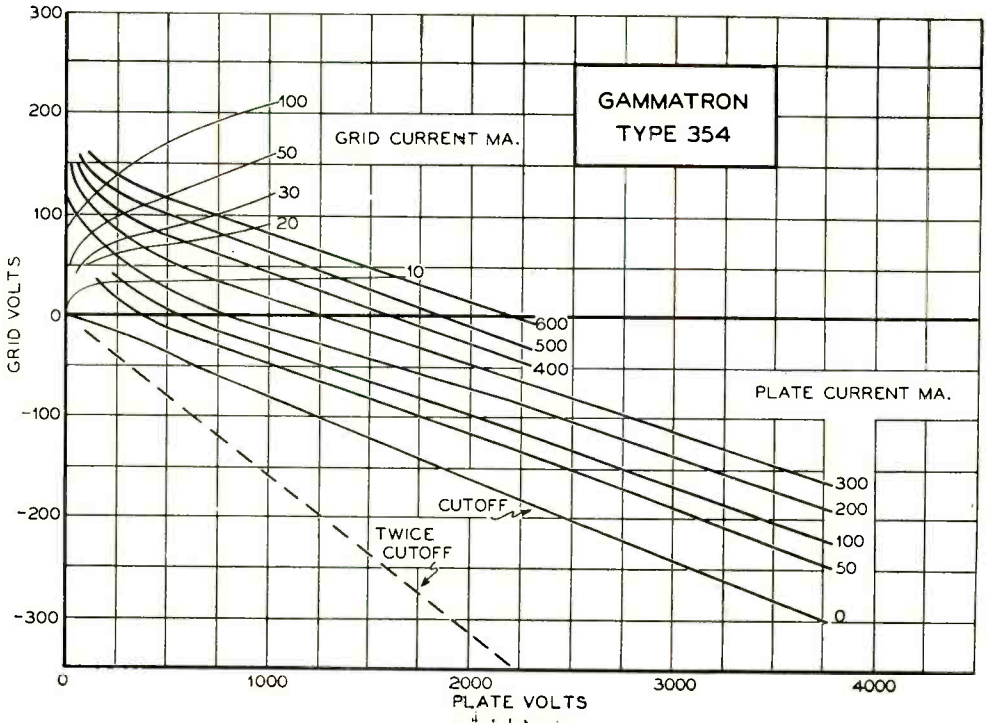


FIGURE 2

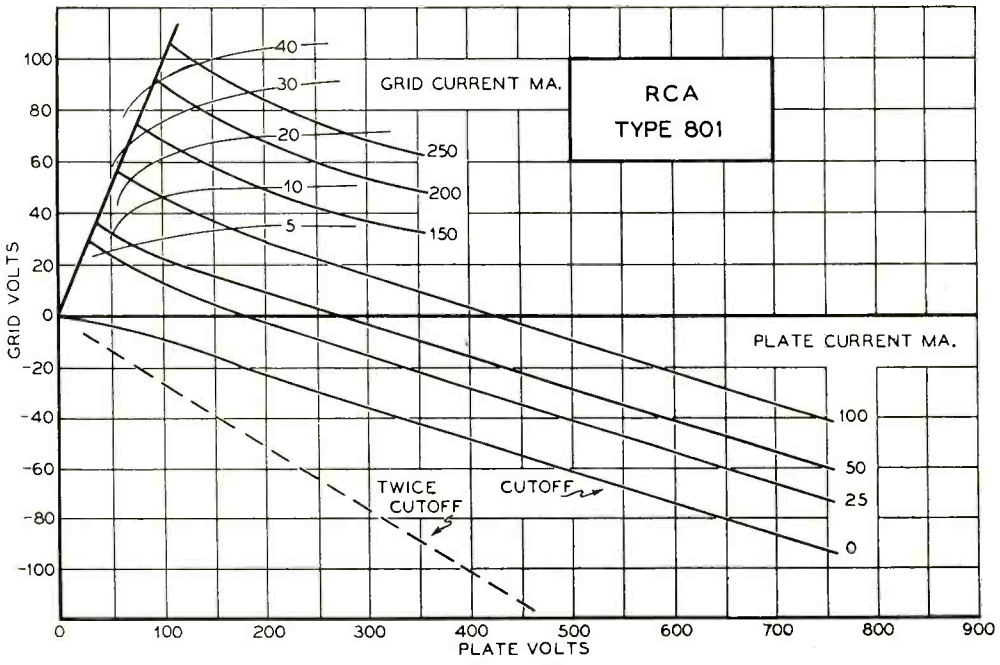


FIGURE 3

The Sine Scale

With point C as our operating point the grid swings toward the positive direction on an r.f. cycle as the instantaneous plate voltage decreases. Going from point C to D and back to C we have completed the positive half cycle of the r.f. exciting voltage. The negative half (in class C operation) drives the grid only more negative and has no useful result and will be neglected. From the electrical viewpoint, going from C to D and back to C means a travel of 180 electrical degrees.

To aid in marking off the intermediate degree points, the sine chart of figure 6 has been devised. Its use is as follows: Place an edge of a sheet of paper along the line C-D of figure 1 and mark the distance between C and D on the paper, labelling each mark with its own letter. Now place the piece of paper on figure 6 so that point D coincides with point A. Pivoting on this, swing the paper until the point C falls upon the 0-180 degree line near B. Holding the piece of paper in position, mark the paper where the 10, 20, 30 etc. degree lines meet the edge of the paper. We now have our length C-D divided into a sine scale and the points can be transferred to the dynamic characteristic of figure 1 as shown.

Plotting the Current Pulse

When the electrical angles are marked off on C-D of figure 1 in 10 degree intervals, a plot of the plate and grid current pulses (similar to figure 7) can be made. The plot is not essential to the analysis, but for the first time it aids in the visualization of what goes on. No plate current flows until we go up the dynamic characteristic to about 22 degrees, where we cross the plate current cutoff line. At 35 degrees the plate current is about 70 ma., at 45 degrees about 220 ma., and so on.

At the 42 degree point the zero grid voltage point is passed and grid current starts to flow. For 55 degrees the plate current is about 400 ma. and the grid current about 15 ma. This procedure is followed to the 90 degree point, or the crest of the r.f. excitation cycle. A glance at figure 6 shows that the same scale for sines is followed from 90 to 180 degrees except that we descend from D to C and add our 10 degree intervals to 90 degrees. Thus in descending, 80 degrees is the same as 100, 70 the same as 110, etc. The simplest method, knowing the current pulses of figure 7 to be symmetrical, is to read points from 0 to 90 degrees and to plot the same current for the same number of degrees on either side of 90.

TABLE I

Angle Θ	*sin* Θ	I_p *ordinate, amperes*	I_p *sin* Θ	I_g *ordinates amperes*
85	0.996	0.640	0.637	0.125
75	0.966	0.600	0.580	0.075
65	0.906	0.510	0.462	0.040
55	0.819	0.400	0.328	0.015
45	0.707	0.220	0.156	0.002
35	0.573	0.070	0.040	0
25	0.423	0.010	0.004	
15	0.259	0	0	
TOTALS		2.450	2.207	0.257

Number of ordinate strips per half cycle— 18

$I_p = \frac{2.450}{18} = 0.136$ amperes $= 136$ ma.

$I_g = \frac{0.257}{18} = 0.0143$ amperes $= 14.3$ ma.

Power output $= \frac{(2.207)\ (850)}{18} = 104$ watts

Power input $= (1000)\ (0.136) = 136$ watts

Efficiency $= \frac{104}{136}\ (100) = 76.5\%$

Load Impedance $= \frac{(850)^2}{(2)\ (104)} = 3460$ ohms

Exciter power required $= (0.0143)\ (450) = 6.44$ watts

$E_B = 1000$ volts

Bias $= -300$ volts

$E_{max} = +150$ volts

Crest excitation voltage $= -(\text{bias}) + E_{max} = -(-300) + (150) = 450$ volts

DEFINITIONS AND FORMULAS

E_B = plate power supply voltage (point C on figure 1)
E_o = Voltage amplitude, equal to E_B—E_{min}
E_{min} = Lowest value to which plate voltage swings throughout the cycle (point D figure 1).
E_{max} = The most positive voltage the grid attains throughout the cycle (point D figure 1).

Direct Current plate current $I_p = \frac{I_p \text{ ordinate total for half pulse}}{\text{total number of ordinates of half cycle}}$

D.C. grid current $I_g = \frac{I_g \text{ ordinate total for half pulse}}{\text{total number of ordinates of half cycle}}$

Power output $= \frac{(I_p \sin \Theta \text{ ordinate total for half pulse})\ (E_o)}{\text{total number of ordinates of half cycle}}$

Power input $= E_B\ I_p$

Efficiency $= \frac{\text{power output} \times 100}{\text{power input}}$

Load impedance $= Z_L = \frac{(E_o)^2}{2\ (\text{power output})}$

Exciter power required $= (I_g)\ (\text{crest excitation voltage})$

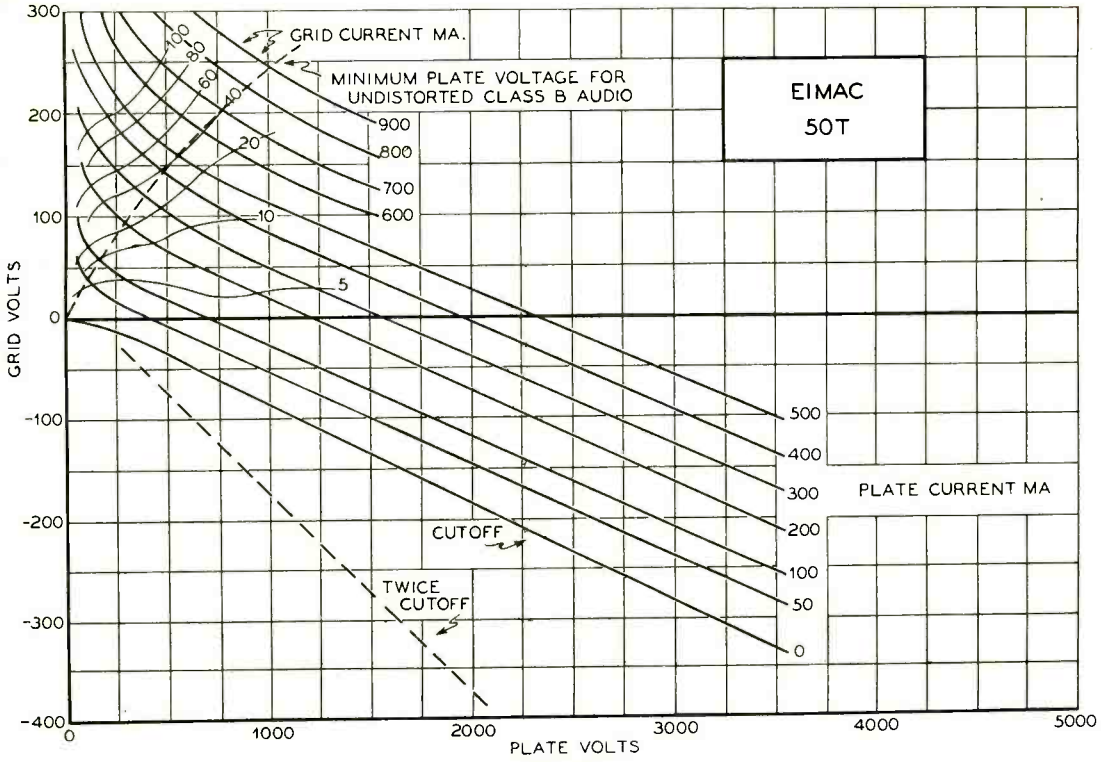


FIGURE 4

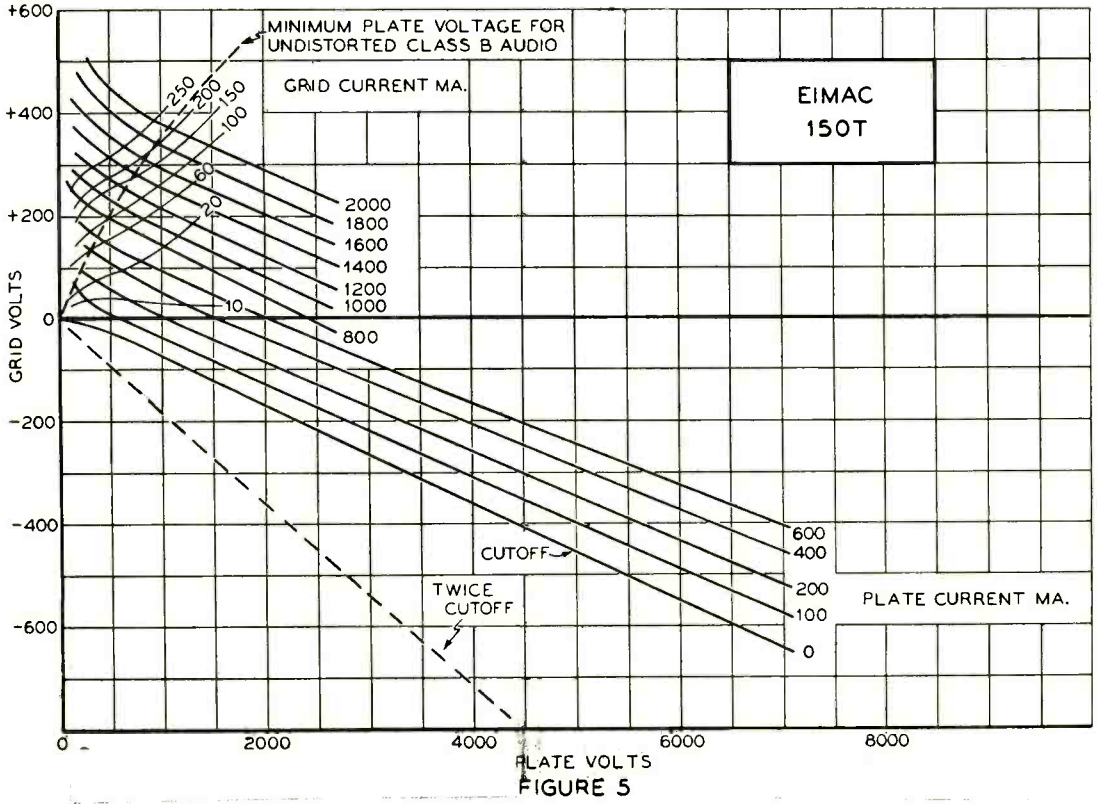


FIGURE 5

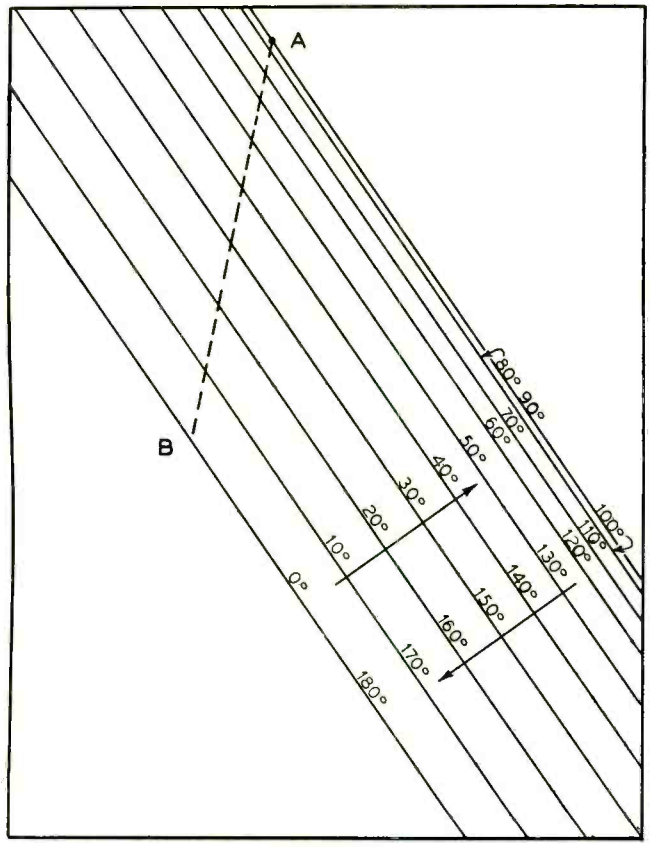


FIGURE 6

Thus 600 ma. would be plotted at 75 and 105 degrees.

After plotting the grid and plate current pulses to scale as in figure 7, the average plate and grid currents (those which would be indicated by a d.c. milliammeter) are found by integration of the pulses over 360 degrees, one complete cycle. This integration may be performed in many ways, one of the simplest being that of taking the value of plate and grid current for every 10 degrees throughout the complete cycle and averaging them. The height of the curve at the mid-point of each 10 degree strip for the pulse is tabulated. By dividing the number of these 10 degree strips per cycle (36) into the total value of the mid-ordinates of the strips for one complete cycle gives the average height ordinate or the d.c. plate and grid current which the intermittant pulses produce. As the pulse is symmetrical, adding up the midordinates for only half the pulse and dividing by 18 instead of 36 gives exactly the same result. This is done in the calculations of table I. The sines are used to obtain the power output, but filling in a table similar to that in table I can be easily accomplished with no knowledge of trigonometry.

Definitions and formulas sufficient for any ordinary calculations are given in table I and are self-explanatory with the possible exception of how to obtain the value of load impedance that is found to be needed. This load impedance is actually the parallel resonant impedance developed across the terminals of the plate tank circuit. The meaning of this in terms of inductance, L, and capacitance, C, of the circuit can be found from the equation:

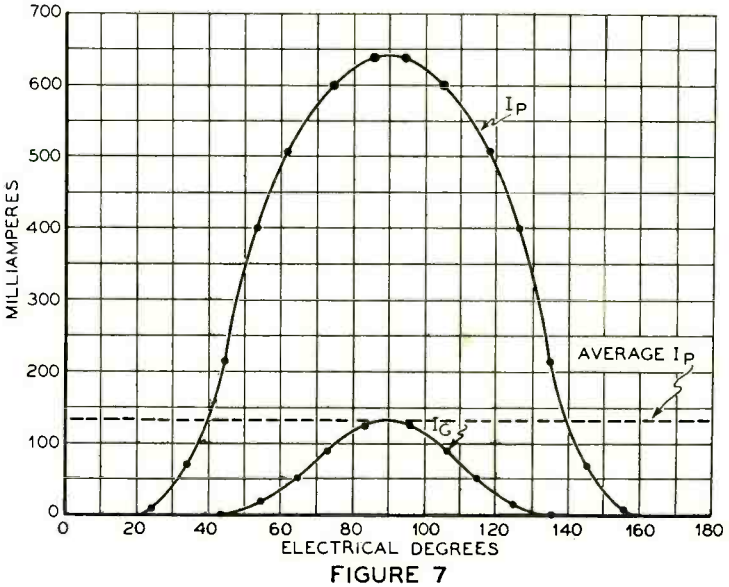


FIGURE 7

$$L = \frac{0.159\ Z_L}{f\ Q}$$

L = inductance in henrys
Z_L = load Z calculated from table I
f = resonant freq. in cycles
Q = factor determining sharpness of resonance peak — about 10 for modulated amplifiers, and more for C.W.

The capacitance may be found from

$$C = \frac{0.0254}{f^2\ L}$$

from which C comes in farads. Some juggling may be required to arrive at values of L and C that are within economic and stability limits.

Figure 8 shows a complete class C analysis of the HK-154 using the peak driving voltage as a variable. These calculated values were closely checked by measurements after construction of the amplifier.

One important conception is that the electrical angles of figures 1 and 7 are really functions of time. The "angle of flow" of the plate current pulse of figure 7 is about 130 degrees. The smaller this angle (obtained by higher bias) the higher the class C amplifier efficiency, but the lower the power output per tube. For amateur work in which tube costs are a consideration, about twice cutoff is best.

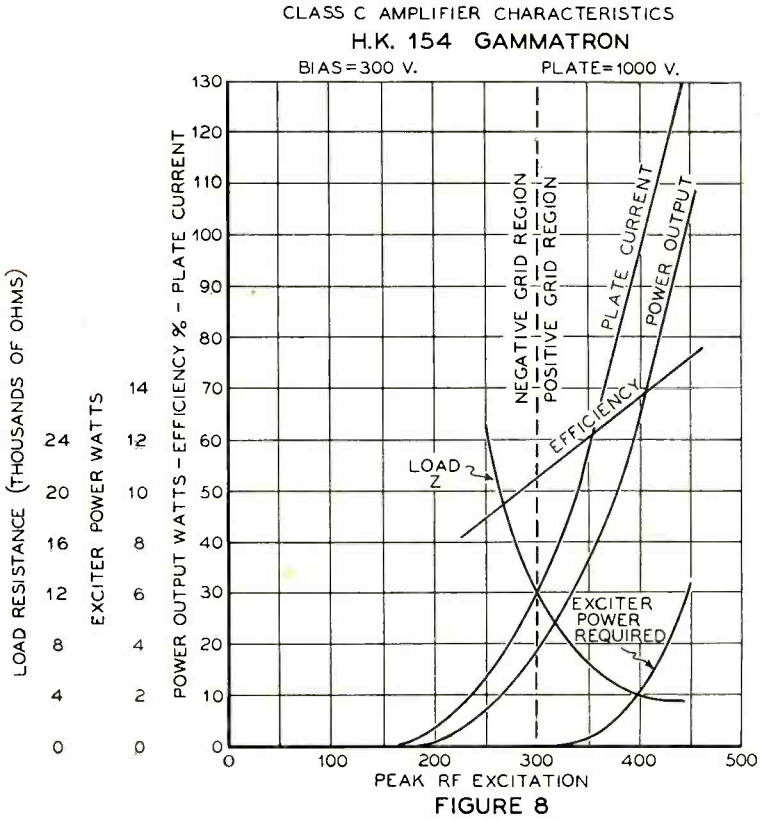


FIGURE 8

◆

100 Mc. Link

[*Continued from Page 19*]

On the middle jump it was necessary to use high receiving antennas to obtain an approximately optical path, on account of an intervening hill. A horizontal diamond is supported from cross arms extending out from the tower. For receiving from the terminal points a large horizontal diamond, supported on wooden poles, is used.

There are a number of things to be learned from this installation. One is that an MO-PA transmitter with concentric-line control can be made quite stable without the use of crystal control. Another is that low power factor lines used as tuned circuits at high frequencies should be given more attention in amateur work, making efficient u. h. f. converters entirely practical for use with ordinary superheterodyne receivers. Lastly, horizontal antennas (including the diamond) may provide several advantages over the verticals currently so widely used by amateurs.

◆

Thermometers were used as indicating devices in early wave-meters. We'll take a neon bulb for ours.

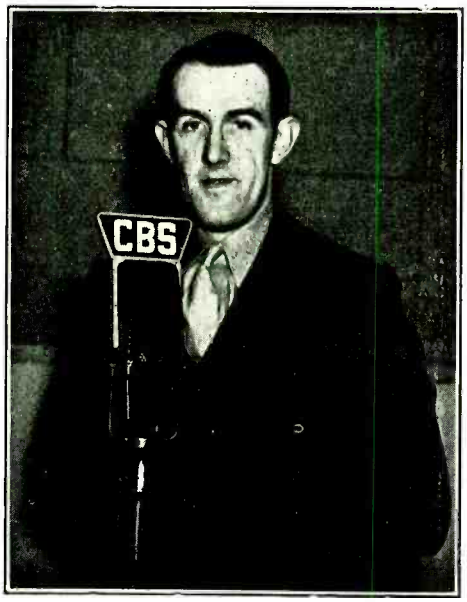
◆

An authority said in 1906, "An entirely satisfactory form of condenser for wireless telegraphy has not yet been designed."

CBS Ham Trophy Awarded

Probably the brightest chapter in the "history of hams" was supplied when floods ravaged the Alleghany River Valley from March 17 to 20, by Walter Stiles, Jr., of Coudersport, Pa. For his bravery in this emergency Stiles won the first annual William S. Paley Amateur Radio Award. The presentation ceremonies were broadcast on the WABC-Columbia network.

On Wednesday, March 17 of last year, the Alleghany River reached the flood stage at



Coudersport. Stiles, employed as an electrician on the Pennsylvania Railroad, decided that a major flood emergency was in the making and went home to get his portable radio equipment ready for action. In the meantime, he pitched into the work of handling flood calls from various points in the flood area over his permanent station, located in a back room of his Coudersport residence. He continued taking routine flood messages until 9:30 the next morning when a desperate call for help came from the CCC camp's amateur station near Renova, Pa.

Renova was isolated, its 4,000 citizens badly needed food, clothing, and medical supplies. Stiles jotted down the message, tried to phone it in to the governor's office at Harrisburg. The telephone lines were down. So Stiles struck out on his own to rush aid to Renova. The Coudersport Red Cross met hurriedly, started at once collecting the necessary supplies. The local CCC camp gave Stiles a truck and a crew of CCC boys to transport supplies and W8DPY's emergency equipment. At six o'clock that evening they started off.

The 68 miles of dirt road from Coudersport to Renova skirt the river all the way. Few who watched the rescue crew depart from Coudersport expected it to reach the destination. For miles the road was covered over with flood waters. Bridges were out. Washouts threatened from below; landslides from overhead. Temporary roads had to be dug out of the mountain sides. Yet, by 1:30 the next morning, the amateur radio crew had reached a point only five miles from the stricken town.

There a mountain landslide had washed the road ahead into the river. Stiles got out of the truck, removed his clothing, and plunged into the swift, cold current to seek a possible footing for transporting supplies and radio equipment on the backs of the crew. Finding no bottom, he clambered out and blazed a trail around the landslide over the steep mountain slopes. By 5:00 a.m. the CCC boys had carried the radio equipment into the town on stretchers; and by 5:30, Stiles began flashing relief messages over the portable rig, set up on the steps of the Renova Y.M.C.A. Sleepless for two nights previously, Stiles pounded out messages continuously for more than 24 hours. When two relief operators arrived from State College, Pa., Saturday night, Stiles was in a state of nervous collapse.

But for 160 hours he had provided Renova with its sole means of communication with the outside world. And the flood and first aid supplies he brought in with his transmitter were all that averted suffering until further help could arrive.

Stiles is modest about his feat, prefers to speak of it in terms of his transmitter's, rather than of his own, performance.

His present transmitter, W8DPY, serves as the Net Control Station of the Army Amateur Radio System for Pennsylvania. In addition, Stiles is technical editor of the "Mason Dixon Stradler", monthly radio publication of the Army Signal Corps.

New Adventure in Old Mexico

By Jo and Bill Conklin*

Now that the Pan-American highway has been completed as far as the Pacific Ocean south of Mexico City, it is possible to get in a car, drive right up through some mighty interesting country to an XE station and toot "HI" on the horn. That is what W9FM and wife (W9SLG) did in a 1929 Ford purchased for the purpose. Some fun if you are thinking of a vacation.

There is no need to dwell upon the trip to Laredo, Texas—which was just so many miles to cover. But when we crossed the Rio Grande singing the song about the "old cow hand," we had arrived!

In Laredo we changed part of our money at the rate of $3.60 "Mex." for $1.00 U. S. The Mexicans didn't understand the occupation of "Investment Counsellor" so put down our occupation as "capitalista." Did we feel swell driving an eight year old bus as capitalists into communistic Mexico! The customs officials didn't tear apart our luggage, but did count the top layer of film rolls to see that we did not exceed the 12 roll limit—not noticing the second layer of rolls.

Leaving Nuevo Laredo on the Mexican side, we drove about 100 miles across what was practically desert, covered with cactus and short scrubby trees. At one place a coyote crossed the road, while at another a ten foot snake slithered across. The road was smooth asphalt. There were a few small towns along the way, with many collapsed mud buildings left unrepaired. Gas stations could be found at least every 50 miles, some having the gas in 20 litro tanks, holding a little more than five gallons. The gas was selling for around twenty centavos per litro, comparable to our prices. It is rated at only 57 octane, making the engine knock on the slightest hill.

After climbing slightly, we saw the mountains—the east branch of the Sierra Madre range. About twenty miles farther on, we climbed 2000 feet in Mamulique Pass to the valley in which lies the city of Monterrey, cuddled at the base of a couple of mountains rising sharply to around 8000 feet.

We arrived at Monterrey in the early afternoon, taking a room at the Hotel Ancira, then walked around town to enjoy the most foreign atmosphere encountered in some time. In fact, in the "Columbus Market" where meat was hanging out for the flies to play on, there were hundreds of strings of garlic—probably enough to supply Italy for a generation.

For local atmosphere we had dinner at a native establishment, deciding on sandwiches and bottled water (Tehuacán). Luckily, the Spanish word for sandwiches is sandwiches. Chicken is pollo, pronounced "polyo". Chicken and turkey are common and among the best meat in the country—though one person remarked that the chicken in his sandwich had probably survived several cock-fights.

After dinner, a visit to "hams" was in order. With a map from an oil company folder left in the car at the border, we tried to find some within a block or two. To our surprise, most of the Monterrey amateurs were located close by. The houses, all one story high, are right next to each other. The walls facing the streets are flat and smooth, with an occasional door and barred windows breaking the plainness. Many people live in a small area. We saw that XE2R was closest, and looked up his house. He was there, and was glad to shake hands with gusto when we mentioned our call as "dobblay-oo nueve ay-fay emmay." He and his wife spoke little or no English—so we started from scratch in Spanish, first attempt at a QSO in that language! He had a 210 or two in a 40 meter self-excited rig, with a receiver that looked like a double-header broadcast job—one side for B.C.L. and the other for 7 Mc. Signals came in just as at home, not a bit weaker.

The XYL's got together in sign language after a short discussion in Spanish of number

*Mr. and Mrs. E. H. Conklin, W9FM-W9SLG, 512 N. Main Street, Wheaton, Illinois.

and ages of our children. Somehow Jo mentioned "patio" and was taken on a tour, each one naming a flower in her own language. The tour included the bath tub, also in the open-air patio, making apparent one reason for the walls about each house. Inside of the walls, one lives practically out in the open.

Juan Lobo of XE2N, who had just moved, probably could not have been found without the personal help of XE2R. We found XE2N and his brother, XE2W, unpacking the rig and setting it up. The main transmitter used a 6L6 in a tri-tet circuit driving a pair of the same as an un-neutralized buffer on any band including the eighth harmonic of the crystal. The final used four 210's with about 1100 volts on their capable plates. Another final, built for the recent contests, uses a single HF100. A modulator was built during the first few hours of the phone dx contest. Practically all bands were used (with a 20 meter fundamental antenna!) and QSO's on five bands were held with one W4 in the recent contest. Juan Lobo is going in for more rapid means of shifting bands. Over seven hundred QSO's during the code contest attest to the peak of efficiency and operating ability, if not the power.

He says that he avoids the band edges, because the many stations calling him QRM each other. Sometimes several hundred reply to him, and usually several can be heard at any receiver setting. As a result, he listens in the less densely populated parts of the band. He doesn't want to use the QSX abbreviation because of the time required in sending it, though if he and all others would use it after each QSO, the reduction in general QRM from useless calling might ultimately benefit him.

XE2N learned his English mostly from our radio magazines. He speaks with practically no accent, as those who have worked him on phone probably know. He has followed the policy of answering each QSL card, though with thousands of contacts in recent months, he is probably supporting the postal system. His business is that of accountant, with such side "rackets" as building broadcast stations.

He took us for a tour about the city, first to his club. The clubs in Spanish America have an excellent attendance at all times—the most popular game being dominoes—and are supported more by the resulting revenues than by the small dues of a few pesos a month. Juan Lobo and Jo took a ping-pong table. After a hard fought battle of three very close games, W9SLG just barely carried off the honors. While driving around to see the manufacturing section of the city—the cleanest industrial city you can imagine—we noticed many houses of the "rich." These showed a tendency to have lower walls or fences, with the house built in the center of a garden, almost the reverse of the average house seen in Mexico.

Though we got to bed at one o'clock, some roosters with a strong sky wave started up at 4 a. m., giving us some incentive to pack up and leave. We stopped twenty miles south to make a short excursion to Horsetail Falls, finding there the most primitive village of the trip. Men driving ox carts in the streets would dismount and stand behind a tree if a

B. J. Kroger and his station, XE1AY. The cup was received from the R. S. G. B. for 28 Mc. achievements.

camera were pointed at them, the oxen going right on. Houses were in good repair, not many made of the unbaked clay bricks used so much on the central plateau. Practically all had roofs. A short way out of town, there was a thatched hut surrounded by a whole family of naked children getting a mid-week bath. On the return trip, the same town after siesta time looked much more modern, with print dresses on the women and shirts on the children. The women, though, wouldn't pose for pictures because of a superstition.

After going through orange groves farther south, we crossed the Tropic of Cancer, according to a sign by the road, then dropped down near sea level where it is supposed to be hot. The humidity was not uncomfortable. We slept under a blanket at the Hotel Mante in

Villa Juarez (Vee-ya Hwar-ez)—until the whistle on the sugar mill got us up. That was one town where the tables were turned on us; instead of our staring at the natives, they stared at Jo in knickers and boots—then just laughed. No matter how little clothing may be worn, practically every woman in Mexico wears a skirt.

At Tamazunchale (Thomas and Charlie), a village to which the Indians come each Sunday to trade their wares for necessities, we found some boys swimming in nature's bathing suits right at the bridge. The gas station man made little of it and said that on Saturdays, the whole town is down there for the weekly bath.

From Tamazunchale we climbed from near sea level right on up to about 8000 feet. For 65 miles the road was gravel, but not bad. In some places, a foot of large gravel was spread over half the road—with everyone using the other half even on blind curves around mountains. As far as Jacala (Ha-ca-la), which first appears 3000 feet below, the beautiful mountains are fertile right up to the top, and are checkered by fields employing "vertical farming." Like all other places along the highway some one will be seen walking or sitting on the road almost every half-mile even when towns are fifty miles apart.

The women have a way of relieving their arms of a burden, such as carrying a child, by tying a shawl around their shoulders, back, and the burden. Water, often in 20 litro gasoline tins, will be carried on the head, or two containers hung from a horizontal stick balanced on the shoulder—counterpoise method. For that matter, in larger cities we saw loaded ice-cream freezers carried on men's heads with other articles in their hands. The best of all was a fellow pedalling a bicycle with a basket six feet in diameter, piled full of buns, on his head. The Indians, going perhaps 100 miles to market, often barefoot on the gravel road, carry large loads slung on their backs. Most of the weight is supported from a cloth band across the forehead, not from the shoulders.

The Indians speak their own language and few know Spanish. When the road was being built some tribes could not be induced to work but retreated into the mountains. They had never seen an automobile, much less large road-building machines, and wanted to have nothing to do with the job. At one time, the government asked forty chiefs to come to Mexico City for a conference. Through interpreters they were told that the government wanted to do something for them, and when asked what they wanted, the answer was, "water." No other need was as important. The government decided to build forty schools for them, but in some as few as six children are said to attend. Most children may be busy taking care of younger brothers or sisters, or collecting wood for cooking.

Some people remark at the poverty of these people. Perhaps it is not so much poverty as adaptation to a situation. With a continuous growing season, there is little need to store crops. Where it doesn't get cold, window glass is unnecessary (much of it in school houses has been broken). Attempts to give them movies and other things common to us may only produce a maladjustment requiring generations to correct.

Beyond the mountains, we saw on the central plateau the Mexico so often pictured—large areas with moderate cultivation around an occasional church, surrounded by trees which mask a small village. Instead of going on to Mexico City to arrive just before dark, we drove eight miles off the road to the large mining cen-

Antonio Cruz Uribe, XE1BT, Pachuca, Hidalgo. His call is well known throughout the world on 20 meter phone.

ter of Pachuca, Hidalgo, located some sixty miles north of Mexico City. A boy directed us to the Hotel Baños where no one spoke English but where we obtained a room and bath at four pesos. The patio was glassed over at the top, with the rooms built around it. Our room had a balcony overlooking the street, provided with a shutter without glass or screen. The altitude was close to 8000 feet so when the sun set, it became cold enough for a topcoat. The peons wore their serapes while those who owned topcoats or sweaters put them on.

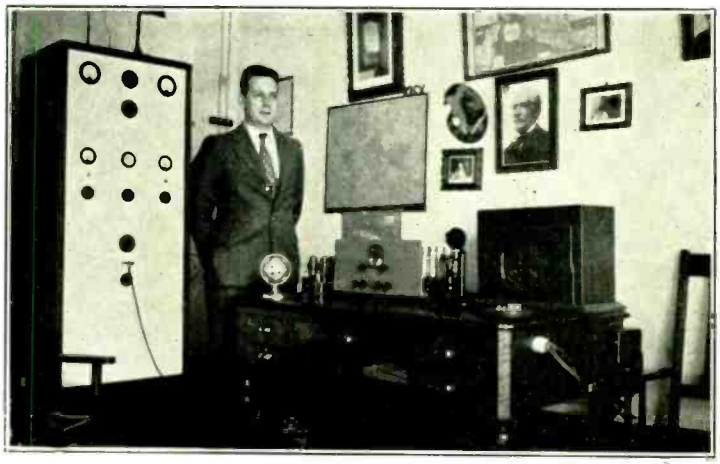
Shortly after arriving we set out to find Antonio Cruz Uribe, XE1BT. There was no answer to our knock but through a window we saw some tubes and heard a voice saying, "calling CQ for any 20 meter phone." A little pounding on the window (glass this time due to the cold nights at this altitude) brought XE1BT to the door. We received a great welcome. Both his parents came to tell us in Spanish that the house was ours. Cruz Uribe told us that his father had owned a ranch but during the revolution when the Indians wanted to kill him, he fled. Now the government will not give him his ranch, although the Indians have not the resources to farm it efficiently or move the products to market, finding small farming impractical. The father is an inspector of roads, while XE1BT has a truck which is used largely by a flour milling concern.

His transmitter uses a pair of 46's or 210's which are shifted between two finals to change bands. On 14 Mc. we tried to raise a phone station without success and we were told that morning and late evening were best for W's. Frankly, we couldn't see how a low angle signal could get out over the mountains, with the city located right on the slope. On code, W2DIJ answered our CQ. We had a short QSO in which there was no evidence that the W2 got a word we said. On 7 Mc. phone we worked a station in Mexico City, though W code QRM nearly blocked both stations. If the W and XE stations who use 7 Mc. for a "local" band for working up to several hundred miles would move up to the 80 and 160 meter bands, much less QRM would result. This is not suggested purely because of the XE phone QRM to us on 7 Mc., but also because the XE's would then be free of the fierce W code on their phone contacts.

At nine o'clock we got around to having supper, which was a "cena general" (say-na hay-nay-ral) including soup with dried chunks of bread in it, some kind of small ranch beans, and a fine piece of steak. We had Mexican chocolate and a small piece of candy for dessert. The Mexicans don't seem to go in much for dessert, except possibly ice cream. Pie and cake, under the general name of "pastel", are hard to make due to the low atmospheric pressure at high altitudes, which reduces the boiling point of water.

At about six in the morning we went across the street for our car which had been placed in XE1BT's garage and were met by Saul Hernandez with a copy of RADIO in his hand. After slowing down his stream of Spanish, we learned that he wanted to give us a subscription, paying in pesos to avoid the need of buying a bank draft in dollar exchange. Cruz Uribe also arrived on the scene to have breakfast with us and show us the silver mines—some only a few blocks away. He had worked XE1HR in Mexico City who volunteered to meet us on our arrival to show us around.

An excursion from the highway took us to the archeological area of San Juan Teotihuacán where are located Quetzalcóatl Palace, and the pyramids of the sun and moon. One pyra-

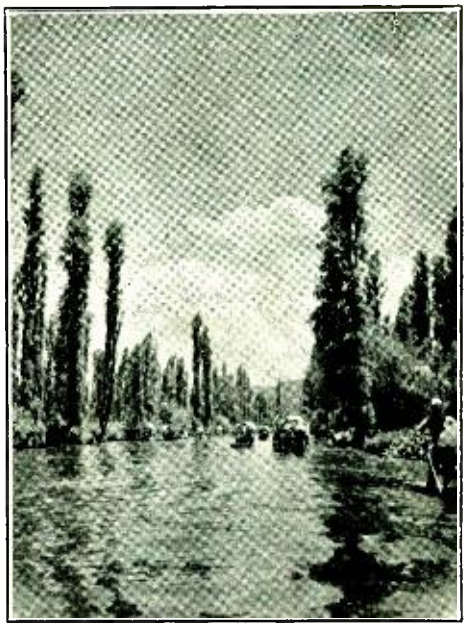


R. W. de Bergue, XE2CV, in Monterrey, N. L., Mexico

mid has a base larger than those in Egypt, but due to the steps and flat top it does not rise as high. Irregular flat stones have been cemented together to form the surface. Some say that these were worshiping grounds of the Toltecs or some other people who came before the Aztecs. South of Mexico City we later visited the Cuicuilco pyramid, made of round stones poorly cemented together, but of interest because of the twenty foot lava flow incasing the base, giving a clue to its age (which is said to be between four and ten thousand years). The lava was excavated about one-third of the way around in 1922, and many crude implements and idols were found.

We barely entered Mexico City and discovered that the street name had changed—which is customary on crossing an avenue. The second trouble was that street signs were placed on building corners, inconvenient to see when the cross street on each side has a different name. Lastly, we had to learn that the police stand sideways to stop traffic, fore-and-aft to indicate "go." The best map of the city was in a folder called, "This Week in Mexico," which gave all the streets and all the names, rather than just a selected few ones as do the gas station maps. A couple of cops told us how to get to the home of E. C. Cuilty at Florencia 33, after much discussion in Spanish as to how to get around on one-way streets. We carefully avoided the Zócalo or central square where a half dozen traffic lanes will confuse anyone. The house where we stayed was beautiful, with nicely carved furniture and inlayed wood pictures, even lavender sheets. Miss Auriel Fredricks who was staying with the Cuiltys said that her first "boy friend" was Clark Rodimon, managing editor of *QST*. It's a small world!

Mexico City people say that they have the weather California brags about—and wishes it had. It is called "perpetual spring." It has one of the highest averages of sunshine in the world. The sun warms the air to about eighty, though evenings and nights may get as cool as the fifties or sixties. No one wears linen clothes, and many carry or wear top coats in the evening. One man showed us the heavy underwear that he wears all year around. Beginning in May some rain falls regularly at about four in the afternoon, the rain being heaviest in August and September, then dropping off to nothing. Many prefer the rainy season because of the extremely clear air and profuse flowers, though it



Xochimilco, the "Floating Gardens", a pleasure spot a few miles out of Mexico City.

is difficult to conceive of more flowers than we saw in April. Many homes and hotels or other large buildings were going up, giving the appearance of a boom. All new construction and much of the old was modernistic, which fits the Spanish style surprisingly well even when the old is next to the new.

The Kroger family, XE1AY, very kindly asked us to dinner on our first night in the city and gave us much information. Places to eat are hard to find, but those specializing in German cooking proved to be as familiar to us as the American. We had difficulty in locating any jelly or jam in the country, but Marge had some for us. The Krogers boil their drinking water, though Bernie said that he consumes plenty of city water when at work, the doctor having said that the supply in the city was probably as good as the bottled water.

The transmitter at XE1AY used a pair of 210's—forced into crystal control when it became necessary to describe the rig after winning the R.S.G.B. 28 Mc. cup. The crystal is on 14,002 kc., but plenty of dx has been worked through the edge-of-band interference, mostly without calling CQ. A battery-operated simple regenerative receiver is used from five to twenty meters even though a superheterodyne

is also available. Many five meter harmonics from various U.S. districts have been logged. Both the transmitter and receiver operate on "end fed" antennas twenty meters long.

Kroger is a sound recording engineer for the movies, so works spasmodically and almost any place in Central America. He traveled to Guatemala for a week in May then left for the U.S. about May 18 with Marge and the year-old baby girl, crossing the whole U.S. from coast to coast, to visit relatives and amateurs. He lost his XE license when those of all foreigners were cancelled, holding only YN1BJ at present. Discussions with the licensing authority may result in issuance of experimental 28 and 56 Mc. licenses for both Kroger and Dr. Hard (XE1G).

The subject of 28 Mc. band division came up. Kroger had already suggested to the A.R.R.L. that the 14 Mc. harmonic relation be maintained. A good wage for a Mexican is 20 pesos a week while the cost of a good crystal and holder is about 30 pesos, so it is easy to see why we should consider the necessity to purchase new crystals in any band-change suggestions.

Much has been said about communism in Mexico. In several discussions on the subject, Bernie was told that "Mexico is not communistic but is only trying out some of Roosevelt's policies." There were strikes even down there: the electricians walked out leaving at a standstill the electrified railroad over the mountains to Vera Cruz until steam locomotives were moved in to establish service.

There was plenty of peculiar auto driving. We marveled at the lack of accidents—until there was a crash in the street outside of XE1AY!

We visited Chapultepec (Grasshopper) park, location of the XDA QRM factory, and saw the castle used by Emperor Maximilian and former President Diaz. The bathtub used by Empress Carlota was also on display. One old French tapestry portrays a game of badminton which many consider to be a new sport. From a balcony we could see the snow-capped volcanos Popocatepetl and Ixtaccihuatl (Ix-tack-sea-wattle) overlooking the city. The National Palace, Cathedral, Pawn Shop, and other places of interest were visited, but the city with a population of over a million out of the sixteen million in the country did not interest us as much as small villages.

One evening we went to a movie. It was a Hollywood production, not one of the local products with Spanish dialog. Spanish titles were projected on the lower part of the screen, not a direct translation of the talking dialog. We took a front seat because the people would read ahead and laugh loudly enough for us to have difficulty in following the English.

On a Sunday we went to Xochimilco (the floating gardens) and managed to get a flower-decked boat for two pesos for one hour although the master of ceremonies or business agent of the boatmen's union tried to get six. Five thousand people were being poled about the "lake," enjoying their day of fiesta. Our greatest amusement came from photographing the interesting faces and calloused bare feet of the boatmen passing us.

A favorite week-end resort for the well-to-do is Cuernavaca, capital of the state of Morelos,

On the upper floor of this modernistic apartment building in Mexico City live the Krogers (XE1AY). The steel shutters below take the place of glass store windows.

located fifty miles south of Mexico City. The road leads over the mountains. From 11,000 feet it drops one mile in eighteen, all of which can be covered with the engine switched off. A garden there was built by a Moctezuma in about 1425—well before Columbus' day. The church is the oldest in the country. Two pal-

Juan Lobo, XE2N, Monterrey, N. L. The unit on the extreme right is the all-band exciter. Just behind the key is the modulator, built during the first four hours of the phone dx contest.

aces used by Cortez also stand there. The woven shoes for sale in Mexico are made in Cuernavaca but tourist and week-end trade provide much of the town's income. The San Anton falls, visited by relatively few, are worth seeing.

We took a room, American Plan, in the Hotel Chula Vista and set out to enjoy the place. First set of tennis went to W9FM, second to the swimming pool. W9SLG took all subsequent matches.

A phone call to Dr. Hard, XE1G, brought an invitation to call at his home the next morning. We had met the Doctor at Thorne Donnelley's W9PZ hamfest. The house was pictured in the May issue of RADIO, along with the three 160 foot pipe masts. These masts are guyed only 50 feet from the bases. Two have fallen in high winds or when a pipe coupling broke. The yard is filled with volcanic rock, some of it in loose small pieces as if it just rained there. A garden has been made only after removing enough rock to build a road.

Dr. Hard prefers the weather in Cuernavaca, the nights being warmer than in Mexico. He said that his thermometer stood at 75° from May to August last year, the high of 85° being recorded when we were there. The direct tropical sun is noticeably warm, however.

XE1G has a store-room full of new parts, eliminating a long wait of months in case something is needed. A lathe has been very useful. The Doctor would light only the filaments of the 1 kw. Collins phone, for fear that the government would get something on him and confiscate the station, the license having been lost along with those of other foreigners. Although a resident of the country for 45 years, Dr. Hard retains his U.S. citizenship, feeling that it was a source of protection to his life and property during the revolution. He is hoping to receive a special license for 28 and 56 Mc. work, though doesn't like the "erratic" nature of the higher frequency bands. He complains of being unable to talk with his old friends who have mostly gone down to ten meters. We believe that he will install a medium power tone modulated and automatically keyed crystal transmitter to serve as a 56 Mc. beacon, as part of his experimental work. This would give the 56 Mc. dx gang something to listen for! His hobby is building receivers, alternating between two chassis, the better always surviving. During our visit a Bound Brook broadcast was coming through very clearly, with no audible set noise, on a three tube t.r.f. set.

Taxco, usually visited by tourists, is said to be the most picturesque town in the country and the one where most artists produce their Mexican work. Many streets, paved with round cobblestones, are so steep that the sidewalks are stairways. Puebla offers another side trip near the volcanos—which can be photographed well from the road or from the Cholula pyramid on a clear morning. We visited a convent that had been operating secretly for two centuries until two years ago when a survey disclosed a large area not accounted for. Nearby was Cholula and its 300-odd churches, each built on one of the 400 religious mounds left by the former residents when the Spaniards came.

Back in Mexico City, we shopped with the help of XE1AY. We were taken to the office of the Mexican League and to XE1AA. Julio wasn't home but his sons showed us the rig. The transmitters were built along a table bread-board style, with the finals on a shelf above. On 7 Mc. the final used an HK354, while on 14 Mc. a pair of 852's did business, altogether the most powerful layout seen in the country outside of XE1G.

Early the next morning we started home, to find the mountain road in a thick cloud with visibility sometimes only 30 feet. The highest part is well paved, though, and it may have been safer in the cloud because the "other fellow" would probably be more careful and drive slowly. The Mexicans sound their horn, then confidently drive all over the road even around blind outside mountain turns. We

[*Continued on Page 74*]

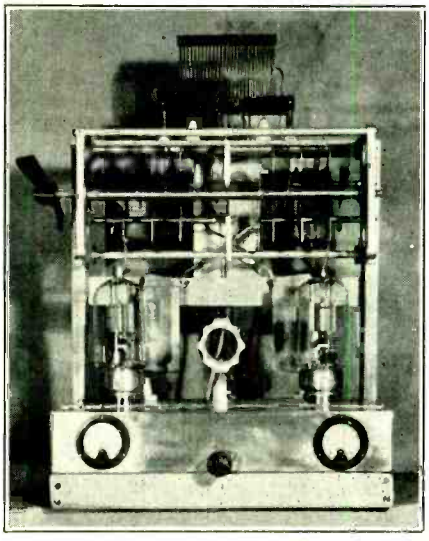
Instantaneous, Remote Controlled QSY (Part II[1])

By Dave Evans,* W4DHZ

In the February issue, W4DHZ described an exciter unit incorporating remotely controlled, instantaneous QSY and band change. In the accompanying article he shows how to apply the same bandchanging and QSY features to a high power amplifier stage designed to take one kilowatt input.

About once a year most of us take a look at the old rig appraisingly and wonder just what could be done in the way of improving it. During this "inventory" one should not neglect to consider the many advantages of instantaneous band switching.

"If I had only been able to flip a switch and QSY from 40 to 20, I could have raised XU1Z in the Dx Contest."



Front View of the QRQ QSY Final Amplifier

"If I could have just said 'Alkyzam[1]' and plopped my sigs on W2UK when he was QSO VS3Z, he would have been in the bag."

Instead of wasting time on laments, the thing to do is to get busy on an exciter utilizing the bandswitching feature described in the February issue. Your present exciter can probably be modified to incorporate this system with little trouble.

Since finishing this exciter, considerable time has been spent on the application of the method to a 1 kilowatt amplifier and antenna system. The final result is a combination that is instantaneously switched from one frequency to another and one band to another by merely turning a single selector switch.

Of course we could use two amplifiers, one for each band, each tuned to the middle of the band with low-C circuits and used over most of the band without retuning, but it is not only cheaper but more desirable to use a single amplifier with r.f. relay switches to short out turns and cut padding condensers in and out.

By using a 6L6 and an 807 in the exciter circuit shown in the February issue (with conventional bias and screen circuits), it is possible to realize about 25 watts output at 500 volts. If we are content with approximately 80 per cent efficiency and do not strive for "perpetual motion", 25 watts will drive our 1 kilowatt (input) amplifier very nicely. The secret is to run normal grid current regardless of what amount of bias is used. In other words, if a limited amount of excitation is available, keep lowering the bias till normal grid current flows, even if the bias may be only slightly more than cut-off. This is preferable to running only a fraction of normal grid current through several times cutoff bias.

The plate voltage chosen for the final amplifier stage, 2700 volts, is about optimum . . . where a *legal* kilowatt (1000 watts) input is to be used. Higher voltage will run up the cost of the power supply considerably, while lower voltage will result in a loss in efficiency at the same input.

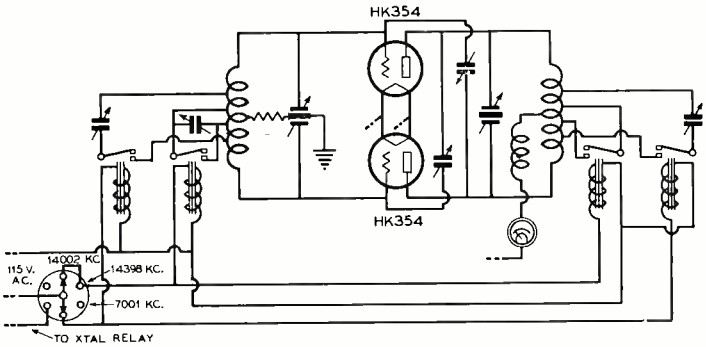
Amplifier Construction

The amplifier uses a pair of 354's in push pull, and is mounted in a hardwood frame 20 inches high by 17 inches by 17 inches. The sockets, grid coil and condenser, meters, grid electrodes of the neutralizing condensers, relays, and padding condensers all mount on a 17 x 10 x 3 inch steel chassis, which is mounted on the wooden frame.

The lower front support rod is removed from the large plate tank condenser and two 6/32 holes are drilled in the stator plates at the end of the condenser. The plate leads to the tubes

*132 Leslie St., Atlanta, Ga.

[1]See February issue, page 51.



Showing how the relays are connected. Circuit values are conventional. See text for data on padding condensers. One bandswitch is used for both exciter and final amplifier.

are bolted to the stator plates in this manner, permitting much shorter leads than would be possible were the leads run over to the regular stator terminals. The screws prevent only about one half-inch of the rotor plates from being used (at maximum capacity setting). A tuning condenser is seldom used with the plates entirely meshed anyhow. We always design our coils to allow a little "leeway" so that we can see the dip "start up on the other side" to make sure that the setting is at minimum plate current.

The relays for the plate tank are mounted on the back side of the amplifier on a metal shield which is grounded to the chassis and not the least sign of r.f. appears on the relay windings. The 110 volt leads to the relays are run in shielded cable, which is grounded.

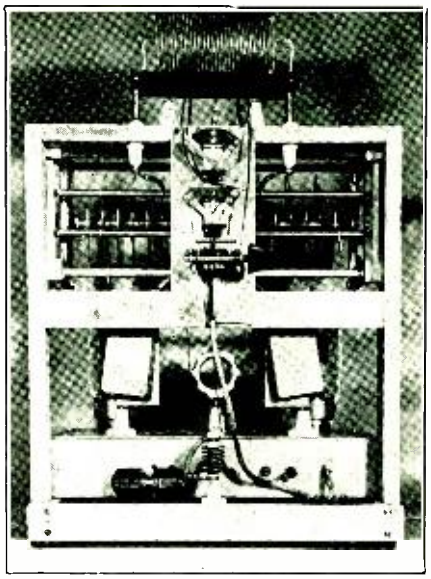
The tank coil is wound edgewise and consists of 26 turns of edgewise copper ribbon, 3½ inches in diameter, spaced over 5¼ inches. At six turns from each end, taps are brought off for band change to 14 Mc. and connected to the band change relay. These adjustable taps will have to be varied slightly, as no padding condenser is used on the band change switch on the final tank.

The grid tank coil consists of 24 turns 2½ inches in diameter, permanently tapped five turns from each end for the band change. The relays and padding condensers for the grid circuit are mounted under the chassis.

Ordinary midgets may be used for the padding condensers in the grid circuit. The padder for the plate circuit consists of a "double spaced" midget (3000 volt spacing) of 35 μμfd. capacity.

The neutralizing condensers, as may be seen in the photograph, are homemade and consist of aluminum plates mounted on standoff insulators in such a way as to be adjustable.

As in the case of the exciter unit, complete data on the amplifier is not given, inasmuch as it is conventional and the purpose of this story is to explain the parts pertaining to band-



Back View, Showing Plate Tank Relays

switching. Other tubes, etc., could just as well have been used; it is merely a matter of personal preference. Correct values of grid leak or bias voltage can best be determined by experimentation, and will vary with different tubes and the amount of excitation available; hence such values are not given.

The relays and padders work on exactly the same principle as the exciter. One minor dif-

ference is apparent: only one plate tank padding condenser is used on the final amplifier. This requires adjusting the taps on the coil very carefully, but eliminates one padding condenser.

The connections to the switch on the amplifier are the same as for the exciter. In fact, the switches shown in the two diagrams (exciter and amplifier) are one and the same switch. In other words, one single switch controls both exciter and amplifier.

With the switch in the "7001" (or other chosen 7 Mc. frequency) position, the final amplifier is neutralized and tuned the same as any other push pull amplifier. It is then switched to "14,398" (or other chosen frequency at the h.f. end of the 14 Mc. band) and the grid coil padders adjusted the same as the exciter coils. The plate tank is resonated at this frequency by sliding the shorting taps in and out an equal distance from the ends of the coil. The switch is then thrown to "14,002" (or twice whatever low frequency 7 Mc. crystal is used) and the appropriate padding condensers touched up on both plate and grid coils for resonance. Reading over the description of the working of the padders and relays in the exciter article will make everything clear and enable one to tune up the amplifier without trouble.

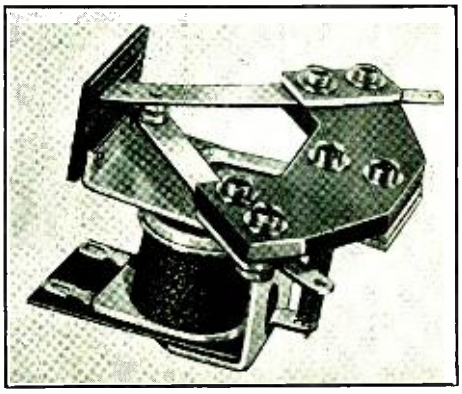
By using a sufficient number of relays and padding condensers, in conjunction with several variable gap crystals, one *could* have available any frequency in either the 20 or 40 meter band. Of course this is probably carrying it to the extreme, but lots of combinations other than the combination of frequencies chosen by yours truly can easily be worked out.

It is not necessary to insert relays and padders for frequency changes of less than 20 kc. on 40 meters or 40 kc. on 20 meters. In other words, it would be possible to work any frequency between 14,002 and 14,042 without using any relays except for the crystal. In this case the padders would be adjusted to peak at 14,022 kc. or so, and the tank circuit would not be changed when using different crystals within the 14,002—14,042 kc. frequency range.

The Antenna System

How about the antenna tuning? At first it was thought that relays would be necessary in the antenna circuit to change bands. However, by using 72 ohm cable and a trick coupling circuit it was found unnecessary to resort to switches, relays, or padders.

Two half wave doublets are used, one cut



Closeup of the r.f. relay

for the middle of the 14 Mc. band and the other for the middle of the 7 Mc. band. Both are permanently coupled to the amplifier plate tank coil by means of individual coupling links around the center of the plate coil.

One might expect a strong 20 meter harmonic when working on 40 meters under these conditions. However, due to the symmetry of the push pull layout and the fairly low bias used on the amplifier, the 20 meter harmonic that is radiated is negligible. It is *much* weaker than the second harmonic from single-ended 40 meter amplifiers using either end-fed or single-wire-fed antennas. If you want to eliminate the harmonic altogether, a relay switch can be connected in one of the feeders to the 20 meter doublet in such a way that the feeder circuit is closed only when the band-switch is in the 20 meter positions.

Now I gotta get to work on a receiver that will automatically switch the transmitter when the receiver is switched from one band to another or tuned from one end of the band to the other. If I don't wind up in a padded cell, I'll be all set for the 1938 contest!

◆

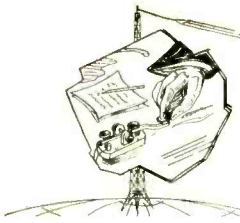
W9WAM has observed that one-cent stamps of the new 1937 vintage curl the corners of thin QSL cards, and that 1936 stamps don't!

◆

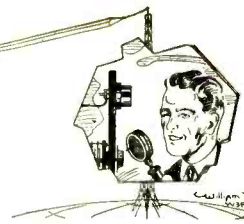
After our radioddity re DC, GA, ND, and VT being the only radio brevities on the U.S. map, W9GPL reminds us that we forgot R.I.

◆

The latest invention pounced upon by paranoia victims is television. According to a late report, the sufferers aver that enemies watch them out of mirrors, by way of television.



CALLS HEARD AND DX DEPARTMENTS



Numeral suffix indicates "R" strength. Send Calls Heard to Calls Heard Editor, not to Los Angeles.*

Dr. Tng. Mario Santangeli, I1ER, Milano, Italy.
(March 6 to 14.)

14 Mc. phone)

W 2IXY; 2SYY; 3AII; 3CRG; 3PAM; 3SAM; 4DCQ; 6ICH.

(28 Mc. phone)

W1COO; W1IXT.

(14 Mc.)

W 1ADM; 1AFB; 1APU; 1AXA; 1BFT; 1BGY; 1BZ; 1CBM; 1CGY; 1CH; 1DAO; 1DBG; 1DHE; 1DJA; 1DUK; 1DUJ; 1DZE; 1EAQ; 1ET; 1EVE; 1EWD; 1EYY; 1EZ; 1FAU; 1FTR; 1FUY; 1GKJ; 1HER; 1HIO; 1HM; 1IBL; 1ICI; 1IGR; 1ISX; 1IWC; 1IXE; 1IZY; 1JDE; 1JLT; 1JLY; 1JVX; 1LZ; 1MP; 1NA; 1NI; 1P1; 1SZ; 2ADP; 2AGW; 2AHC; 2AIR; 2AIW; 2ALB; 2ALD; 2ALK; 2ALO; 2ARB; 2AWF; 2BCK; 2BEF; 2BHW; 2BHZ; 2BNX; 2BYK; 2CJM; 2CMX; 2CTC; 2CTO; 2CUQ; 2DJB; 2DJT; 2DNU; 2DOE; 2DSB; 2DXO; 2EMJ; 2EWD; 2FOH; 2GRA; 2GUD; 2GUM; 2GUX; 2GVR; 2GYM; 2HFP; 2HHF; 2HVM; 2HXT; 2IOP; 2IUV; 2IYO; 2KL; 2JAB; 2JNO; 2JT; 2LI; 2MJ; 2OA; 2OC; 2SE; 2UK; 2ZA; 3AIU; 3ANH; 3ANS; 3ANZ; 3APJ; 3BAL; 3BDI; 3BEK; 3BEN; 3BLI; 3BQP; 3BSB; 3BSY; 3BXG; 3BZ; 3CDQ; 3CQV; 3CHE; 3CUB; 3DAJ; 3DAL; 3DMQ; 3DYS; 3ECS; 3EGN; 3EIL; 3EMM; 3ENX; 3EV; 3EVT; 3EYS; 3FDJ; 3FGJ; 3FIKK; 3FQP; 3FRE; 3FWH; 3GAD; 3GAP; 3GEH; 3GIP; 3GMS; 3GRP; 3PC; 3UVA; 4AEL; 4AGB; 4AGI; 4AH; 4AQU; 4BWX; 4CBY; 4CPZ; 4CRA; 4CZX; 4DCZ; 4DQH; 4DQX; 4DV; 4DX; 4DYB; 4DZO; 4DZS; 4ID; 4LX; 4NC; 4NN; 4TO; 4YC; 4YCW; 4ZS; 4ZH; 5BXN; 5DEW; 5DM; 5EHM; 5EKK; 5FNA; 5FYN; 5HJT; 5JC; 5VV; 6AM; 6AZS; 5BAM; 6CD; 6CDQ; 6CQI; 6CXW; 6EW; 6FOY; 6GRB; 6GRL; 6GRX; 6HJT; 6JBO; 6JCH; 6JKH; 6JJA; 6JWT; 6KQH; 6KRI; 6KUT; 6KWA; 6LAC; 6LKO; 6LYM; 6LWP; 6MHH; 6MUO; 6MYS; 6NSA; 6PZL; 7AMQ; 7AMX; 7AVR; 7AYJ; 7BAC; 7BD; 7BVI; 7BYW; 7EK; 7FWD; 7LEC; 8AAT; 8ARO; 8AV; 8BAI; 8BDY; 8BLP; 8BNX; 8BQJ; 8BTI; 8CDV; 8CLM; 8CJJ; 8CMB; 8COK; 8DAE; 8DGP; 8DLT; 8DML; 8DOD; 8DQU; 8EMW; 8FCB; 8FNN; 8GHN; 8GWT; 8HYC; 8HWE; 8IIL; 8IOT; 8KCM; 8KO; 8JDB; 8JFC; 8JFN; 8JIN; 8LAP; 8LCN; 8LEC; 8LIR; 8LUQ; 8LZK; 8MAH; 8MCY; 8MQ; 8MTY; 8HIK; 8NUY; 8NV; 8OKC; 8OQF; 8OTO; 8QDU; 8QMY; 8TOE; 9AFN; 9AFO; 9AGM; 9ARL; 9BPU; 9CWW; 9DGT; 9DMA; 9DNP; 9EH; 9EZQ; 9FDO; 9FS; 9FSO; 9FYY; 9HFJ; 9HXM; 9KYU; 9JFB; 9LKI; 9LJU; 9MV; 9MWH; 9HST; 9PLM; 9PSQ; 9PST; 9PV; 9RCQ; 9RH; 9SZQ; 9TB; 9TPI; 9UM; 9UOX; 9USZ; 9UTT; 9UYF; 9VIN; 9VQW; 9WKS. — K 5AA; LU2AX; PY2DN; VE1AX; VE1EC; VE2AX; VE2BK; VE3JT; VE3QH; VE4RO; VK2FM; VK3AH; VK3JT; VK4LE; VK4RX; VK5XJ; VV5AA; —Z 11CC; 11BC; 11DA; 11DM; 11FE; 11JY; 11LM; 12CW; 12MA; 12II; 12MV; 13AX; 13TR; 14AF; 14AO.

(28 Mc. band.)

W 1ADM; 1AS; 1BUX; 1CGM; 1CGY; 1DA; 1DFR; 1DZB; 1DZE; 1GDY; 1JIZ; 1ME; 1SX; 1TH; 1TR; 1TW; 1TWH; 1ZB; 2AOG; 2AUT; 2BHZ; 2BQK; 2CBO; 2CDL; 2CHE; 2CPA; 2CTO; 2DSB; 2DTB; 2FHI; 2GUM; 2HYT; 2JME; 2MB; 2ZA; 3AIR; 3AXU; 3DDX; 3EMM; 3EVT; 3FKK; 3FQP; 3KT; 3MWY; 3PC; 4AH; 4AUU; 4EDQ; 4YC; 5VVW; 6IHT; 8ANB; 8DMK; 8DYE; 8FJN; 8HRD; 8IFD; 8II1; 8IOT; 8IWG; 8JFC; 8JMP; 8LEC; 8LDA; 8LUQ; 8MWY; 8NJP; 80K; 80KC; 8QDU; 8QY; 9ADN; 9ARL; 9CVI; 9GIL; 9KA; 9IWX; 9JDD; 9IDI; 9IQE; 9MXW; 9PST; 9PWZ; 9TJF; 9TPF; 9TPI; 9UHM; VE3KF; PY2AC.

Blanche H. Oliveira, K6MZK, P. O. Box 872, Hilo, Hawaii.
(Feb. 20 to March 13.)

W 4EM-9; 5EBO-6; 5ELW; 5EZH; 5FNY; 5FUA; 5GGX; 6AFB; 6ABZ; 6ABF; 6BUE; 6BWX; 6BXQ; 6CUT; 6CXB; 6DDS; 6DUB; 6ELW; 6EWU; 6GNW; 6HJU; 6HOE; 6IMN; 6IWH; 6IRC; 6JJE; 6JLL; 6JTQ; 6JUM; 6JWY; 6JZI; 6KFB; 6KFX; 6KYA; 6LDQ; 6LGW; 6LJV; 6LQE; 6LTE; 6LVJ; 6LYY; 6LXD; 6LZD; 6MCX; 6MKV; 6MMK; 6MRF; 6MVT; 6MYL; 6NEF; 6NFW; 6NNS; 6NOG; 6NSY; 6NUR; 6OGZ; 6OBV; 6ODV; 6OJE; 6ONL; 7AEM; 7CMX; 7ENX; 7FAA; 7FHB; 7FTA; 7FYD; 7GEJ; 7HB; 9FXD; 90SO; 9UAP; 9VMS; 9YRM.

*George Walker, Assistant Editor of RADIO, Box 355, Winston-Salem, N.C., U.S.A.

Herbert J. Gleed, Jr., W9BHP-W1ION, c/o Tropical Radio Telegraph Co., Bluefields, Nicaragua.
(Feb. 16 to March 16.)

(14 Mc. phone.)

CO 2EG; 2JJ; 2KC; 2KL; 2NH; 7CX; 7HF; 7VP; 8YB; EL1A; HH2B; HK50BC; K6BAZ; K6JLV; K6NTV; K60JI; 0A4AK; 0A4C; 0A4N; VE1CF; VE1DQ; VE1GR; VE2FO; VE3ER; VE3QZ; VE4AW; VE4GD; VE5DK; VK2ABG; VK3LI; VK3RW; VK4RG; VK4VD; VK4ZG; VP6FO; VP6YB; XE1BP; XE2H; XE2N; YV1AP; YV4AA; ZE1JR.

(14 Mc.)

D3BMP; D3CFH; D4MNL; D4QMN; D4WXB; D4XCG; D4YBF; D4YFF; EI4J; ES5D. — F 3AK; 3FS; 3KH; 8EB; 8FW; 8GQ; 8JI; 8LX; 8NR; 8SN; 8TM; 8ZU; FA8DA; G2MI; G5MS; G6VY; G8II; HA5C; HA7B; HA8G; HB9J; I1IR; J3FZ; K5AA; K5AY; K6CGK; K6COG; K6NJU; LA1M; LY1J; OE1ER; OE3AH; OE7EJ; OK1MB; OK2HX; OK2LO; OK2MM; OK2OP; ON4CD; ON4FE; ON4FQ; ON4GK; ON4HC; OZ2B; OZ3X; OZ3U; OZ8A; OZ8J; OZ8JB.— PAO AZ; DC; KK; MP; OK; OO; PN; QF; QQ; QZ; TSK; UN; PYBLR: PY2BX; SM5QU; SM5SH; SM5TI; SM5XR; SM6QP; SP1BA; SP1BC; SP1ER; SP1GZ; SP1LN; SP1MF; TI5AD; U1AD; U1BL; U2NE; U9ML; UK3AH— VE 1CO; 2DF; 3HI; 3HT; 3KF; 4ES; 4NN; 40C; 4RO; 4WJ; 5KC; 5LG; 5NP— VP2A; VK2BK; VK2HP; VK3EJ; VK3RW; VK3VF; VK4DO; VK5JU; XE1DG; XE20; ZE3CG; YL2CD; YR5AR; YR5CF; 6U7DX— ZL 1CV; 2II; 2JQ; 2MM; 3AZ; 3FZ; 3JA; 30R; 4FK; ZS1Z.

L. F. Strobel, W8BSR, 2626 Sixth St., Cuyahoga Falls, Ohio.
(March 1 to April 15.)

(14 Mc. phone.)

EL1A; G6XR; HC1JB; HK1GK; K6MVV; LU2CR; LU4BH; LU7AC; LU9KA; PY2AC; VK2CP; VK3HF; VK5XB; VP6YB; YV1AP.

(14 Mc.)

CE1AQ; CE3AR; CE3BQ; CE3DW; CE3EQ; CP1AA; CT1FI — D 3BIT; 3DSR; 3FZI; 4BDR; 4BFU; 4GAD; 4SM0; 4XCG; 4XLI; 4ZPI; EI3L; EI5F; EI8B; EL2A — F 3AD; 3AM; 3AU; 3LE; 3KH; 8EO; 8FE; 8FK; 8IL; 8JI; 8KH; 8NR; 8PZ; 8RR; 8TG; 8ZF; 8ZZ. FA8DA; FA8IH; FB8AE; FM8AD; FT3AE; FT4AK; FY8C — G 2CL; 2DL; 2HC; 2KU; 2KV; 2LB; 2NH; 20A; 2VZ; 2WP; 5BJ; 5DS; 5FY; 5QY; 5VN; 6BQ; 6BS; 6CL; 6DT; 6FQ; 6GL; 6LJ; 6LK; 6MC; 6PD; 6RB; 6TO; 6TR; 6VC; 6VK; 6VP; 6XU; 8AC; 8FZ; 8IL; 8ND. GI5WD; GI6TK; GM2WL; GM6KH; GM6NX; GM6RG; GM6VH; GM6XI; HA2D; HA8D; HB9T; HC1GO; HC2HP; HK4AG; I1TKM; J2JJ; J2LU — K 4UG; 5AA; 5AC; 5AG; 5AJ; 6AKP; 6BRZ; 6BNR; 6BUX; 6EO; 6JPD; 6KLL; 6LGK; 6MAW; 6MTH; 6NJU; 60GD; 60JG; 7KD; LA3H; LU1CH; LU3EV; LU4DQ; LU4MR; LU5AN; LU6AX; LU7AZ; LU7FA; LY1HB; LY1KK; 0A4AK; 0A4AQ; 0A4AJ; 0E3AH; 0E7EJ; 0H50N; 0H50J; 0H6NQ; 0K1XA; 0K2HX; 0N4DX; 0N4SJ; 0N4VU; 0N4VW; 0N4UX; 0Z2B; 0Z2EA; 0Z7CC; 0Z9Q; PA0KK; PA0MDW; PA0PN; PA02Z; PA0UV; PA0VW; PK3BM — PY 1BR; 1DI; 2AG; 2BX; 2DO; 2EA; 2EC; 2GS; 3BY; 3ZK; 4AZ; 5QG; 7AB; 8AH; PZ1AL; PZ1PA; SM5RH; SM6QP; SM6VX; SM6WL; SM7UC; SM7YE; SP1FW; SU1CH; SU1SG; SV1KE; TI2LR; U1AD; U1AP; U2NE; U9AW; U9MF; U9MI; U9ML — VK 2ADE; 2AER; 2BK; 2DK; 2FM; 2GY; 2HP; 2IG; 2JO; 2LA;2MT; 2QL; 2U; 2VA; 2VN; 2XD; 2YF; 2YL; 2YD; 3BL; 3DG; 3DM; 3EO; 3GC; 3GP; 3GX; 3IR; 3IW; 3JD; 3JK; 3JT; 3LX; 3MI; 3MR; 3NG; 3NS; 3PA; 3SB; 3SG; 3UH; 3VF; 3XQ; 3ZG; 3ZC; 3ZR; 4AE; 4AP; 4EL; 4ER; 4HR; 4KC; 4LE; 4RF; 4RR; 4SD; 4UL; 4UR; 5AC; 5HL; 5LD; 5LY; 5MD; 5PS; 5WK; 5ZK; 6CA; 6CP; 6FO; 6KP; 6LJ; 6SA; 6YZ; 7CL; 7LZ; 7NG; VP1WB; VP2TG; VP4TJ; VP6LN; VP6MY; V08AF; YL2CG; YR5AA; UR5CF; ZE1JR — ZL 1DI; 1DV; 1GX; 1HH; 1HY; 1IL; 1JZ 1KJ; 1LZ; 2FA; 2GN; 2MM; 2MN; 2NJ; 2PM; 2SM; 2SX; 3AX; 3GK; 3GR; 3JA; 4AO. ZS1AH; ZS2A; ZS2X; ZX2A.

Richard Treffeisen, SWL-W2, 10 Sycamore Ave., New Rochelle, N. Y.

(March.)

CE3AR; CM8AF; CO2EG; CP1AA — D 3BIT; 3CFH; 3DSR; 3GKR; 4DDN; 4CSA; 4GAD; 4GFF; 4HNG; 4KED; 4MNL; 4NXR; 4QET; 4SMA; 4SNP; XCG; 4YF1; 4ZZH. EI4J; EI5G; EI8J; EI9J; F3KH; F3LE; F8DN; F8DR; F8TM; F8WQ; F8ZF; FA8DA; FM8AD — G 2CK; 2IM; 2LB; 2PL; 2PU; 2VZ; 2YK; 2ZQ; 5DS; 5IW; 6CJ; 6FZ; 6HW; 6KH; GI5QX; GI6TK; HA8D; HA8G; HA8N; HK3JA; I1IR; J2MH; K5AA; K5AJ; K5AY; LA1G; LA1N; LA6C; LA6U; LU5AN; LU7AZ; LY1HB; LY1J; OA4J; OE1ER; OE3AH; OE7EJ; OH3NP; OK1MB; OK2LO; OK2OP; ON4CD; ON4CN; ON4GK; ON4IF; OZ2M; OZ3D; OZ7SS; OZ8J; OZ8JB — PAO AD; AZ; DC; GN; KK; PN; OO; QF; QZ; UN; UV; PY2BX; PY2GA; PY5OG; PY8AH; SM5NA; SP1LN; SU1SG; U2NE; U3AG; VK2HP; VK2NY; VK3CP; VK3VU; VK6NO; VK6SA; VK7CL; VK7KR; VU3P; VP2AT; XE1CM; XE1DG; XE2N; YL2BB; YM40A; YR5AA; YR5CF; YV5AA; ZL3GR; ZL4AF; ZS1AH.

J. L. Condon, W1DKD, 4 Charles St., Rockland, Mass.
(March and April.)

(7 Mc.)

AR8VP; CN1CR; CT1BD; CT1IA; CT1KN; CT1LZ; CT10I; CT1PC; CT2BJ; CT2BU; CT3AB; D4HNG; D4MNL; D4NXR; D40YT; D4PKU; D4SSH; D4XCG; D4YFR; EI5F; EI7W; F3KH; F8EO; F8IQ; F8QF; F8TQ; F8ZF; F8ZW; FA8LC; FA8PW; G2AA; G2MI; G2MO; G2XM; G6GX; G6PM; G8HK; HA2L; HA8C; HB9AG; HB9BD; HC1FG; HK5JD; HR4AF; I1GA; I1TKM; K5AY; LA2B; LY1J; NY4AP; OE1EK; OE3AH; OE6AX; OE7EJ; OE7FW; OK1CB; OK1JZ; OK2AH; ON4AB; ON4CD; ON4DA; ON4DZ; ON4NO; ON4NRA; OZ2LD; OZ2M; OZ3X; OZ9U; PA0AZ; PA0CO; PA0JY; PA0NL; PA0PN; PA0QF; PA0UV; PA0YB; PY1DW; SM6SS; SM7QD; SP1IH; TF5Q; TI2LR; TI2RC; VK1EX; V01M; V04Y; VP2LB; VP2LD; VP5AE; VP6RB; VP7NR; XE1LJ; XE2FG; YM4AA; YR5AA; YV5ABJ; YV5AN; YV5AO; YB8AA; ZS2A; ZZ3A.

R. D. Everard, "Oakdene," Lower Sheering Road, Sawbridgeworth, Herts, Eng.
(Feb. 18 to March 18.)

(28 Mc. phone.)

W1-AAK; ANA; ARB; BBM; BQQ; CAA; CDO; CJH; CJM; DBE; DEY; DJK; DLJ; DNL; DQK; DSV; DTO; EKT; ETA; FLO; FNL; FZA; GGV; GPE; GYA; HUG; IAD; IDY; IWW; IXP; IYJ; IYT; JJH; JQA; JRZ; KJJ; KFC; SZ; TW — W2 -ADG; ADI; AG; AMJ; BAA; BGY; DJX; DK; DVM; EJO; EPD; EZI; FPH; FWS; GAH; GFH; GJK; GJW; GOQ; GQF; GZS; HEJ; HRV; HWX; IBU; IJD; IKS; ILO; IQO; ISY; IUR; JMC; JNP; JRR; JUJ; JUX; JWD; JXI; JZQ; KAA; KAX; KBG; KIY; KMB; KUY — W3 -AIR; AKX; BJU; BSY; CBT; CHE; CKT; CWG; DLY; DRA; FBK; FDG; FEA; FFR; FGW; FRE; FVA; GIF; GIV; GIZ; GPM; IU; PC; RL; WA — W4 -AH; AUU; DDM; DEK; DFU; DON; DRZ; EBM; ECE; EDQ; EED; EGH; EGJ; EYQ; FT; GB — W5 -ALE; BSK; BXM; CQJ; DDP; DLC; DUK; DUQ; EEH; EKF; EMC; FHJ; FRA; PH; OF; WR; ZA — W6 -CKR; CUU; DKQ; DTB; DZH; ERT; FEQ; GBO; GZU; ITH; JJU; KEI; LWN; MAF; MDN; MVO; NLP; NLS; NTR; NWQ; YU — W7 -EMP; FDL — W8 -AGU; BIQ; BLW; BSM; BWB; CFU; CHB; CJM; CKY; CLG; CLS; CNA; CPC; CYT; DKX; DLA; DST; DW; DXK; EAK; EBS; EDR; FC; FSA; FYC; GLJ; GLY; GWZ; HSP; ISC; IWA; IWG; JFC; JMM; JQY; KXU; KYY; LAC; MAH; MBK; MEV; MNJ; NDL; NKY; NSC; NU; NVD; NXF; PHD; PID; QBO; QDU — W9 -AGO; ALD; ARA; AWN; AZE; BBU; CLH; CSB; CSI; CUN; CV; CXA; DDF; DET; DN; DRA; DRK; DRQ; DSL; DWU; EFY; EW; FAA; FWN; GBS; GGP; GWM; GYK; GZK; HDU; HZL; IGM; IJX; IWF; JIL; JNT; HOL; KD; KFY; KPD; LKI; LQ; LQT; MOD; MXW; PEP; PQH; PSC; PWN; RHL; RNX; RSQ; SMN; TIO; TLQ; TMP; TTB; TZI; UEL; UOR; UPX; UYD; VBK; VGC; VJD; VXZ; WQQ; WSB; WXT; YFQ; YHQ; YQN; YWU; CN8AM; K4DDH; K4EPO; D5AF; D6MV — VE -1AU; 1BR; 1DT; 1IF; 2CA; 2JU; 3AEL; 3ER; 3KF; 3LU; 3TY; 4BF; 4KX. VP5PZ; YL2BB; YL2CD; YT7KP; ZE1JR; ZE6AJ.

Donald W. Morgan, 2CBG, 15 Grange Road, Kenton, Middlesex, Eng.
(March 1 to April 1.)

(14 Mc.)

W1 -AAX; ABL; AGH; AJZ; AKT; APV; AQL; AWL; AXL; AXT; AXW; AXX; BCK; BFT; CO; COM; CQH; DAY; DHD; EH; ENM; EOW; FAU; FFA; FTR; FUC; FUY; HFN; HKC; IGJ; ISX; IZC; IZY; JJE; JOJ; JVX; KAK; KBN; KUJ; MJ; OAW; VER; WPL — W2 -ADM; AIO; AJK; BER; BM; BNX; BUC; CHS; CKC; DSB; DUX; EJU; EWD; FOH; FPL; GAU; HMQ; JGL; JVV; KGC; UKW; VAA; 3BDA; 3EEE; 3EXB; 4ACV; 4DCQ; 8CCD; 8CJJ; 8DLA; 8DR; 8FAP 8FCX; 8JMG; 8LYC; 8MZE; 8NEQ; 8NOC; 8NSC; 8NTA; 8NTR; 8OQU; 8SWE; 9ARK; 9CFB; 9EMR — D -3AAN; 3BFN; 3BWN; 3DTN; 3YFH; 4AHC; 4CPP; 4CXF; 4DNC; 4FND; 4GOF; 4HNG; 4JBG; 4JHB; 4JTK; 4KMG; 4LDM; 4NBR; 4TGT; 4WXD; 4XCG; 4XKG; 4XUF; 4ZZS. EI3G; EI5B; EI5J; EI6G; EI8B; EI8M; EI9F; ES5D; F8FK; F1KR; F8PZ; FA3JZ; FA8BX; FA8GT; FA8JO; FT4AG; FT4AE — G -2DL; 2IM; 2JA; 2KX; 3NM; 2PV; 2QY; 2UV; 5AO; 5JA; 5LI; 5NH; 5UR; 5YC; 6ALP; 6LJ; 6PK; 6QA; 6VP; 6WN; 6UR; 8AL; 8DN; 8FZ; 8HU; 8MH — GM -2JK; 2KF; 2LL; 2UO; 5YG; 5YN; 6BM; 6JH; 6NX; 6XR; 8HP. HA1G; HA2L; HA2R; HA6A; HA6D; HA6R; HA8C; HA8D; HA8N; HB9AC; HB9AJ; HB9AS; HB9XD; I1AH; I1AV; I1GA; I1IT; I1KV; I1SMT; I1TKM — LA -1H; 1V; 3H; 3J; 3P; 3Q; 3Y; 4K; 5K; 5M; 5Q; 6B; 6L; 6T; 6U. LU3EV; LU5AN; LU8EN; LY1AF; LY1H; LY1J; LY1KK; LX1AJ — OH -1JE; 1NE; 2NT; 2OB; 2OG; 2PB; 3NJ; 3OA; 5NF; 5NG; 5NH; 5NM; 5OH; 5OJ; 6NS; 8NH. OK2CM; OK2IR; OK2RR; ON4OA; ON4WX — PY -1AP; 1BR; 1CK; 1DQ; 1DS; 1EW; 2HM; 2AW; 4AP; 5AG; 5AP; 5QD — SM -5PA; 5PG; 5QL; 5QO; 5SI; 5SX; 5TA; 5TI; 5UC; 5UH; 5UO; 5VV; 5WJ; 5YU; 6PA; 6QN; 6QP; 6UX. SP1AR; SP1IER; SP1LM; SP1LP; SP1MX; SP1TW; SU1CH; SU1KH; SU1UG; SU1WH; SU1WM; U2AN; 73CY; U5KQ; UK5AA; VE1AL; VE1EA; VE1EB; VP2CD; YM4AA; YM4AI; YR5AA; YR5CF; YR5CP; YR5PA; YT1GU; YT7KP; ZB1J; ZL1L.

John Carothers, 2407 Garfield St., Lincoln, Neb.
(Jan. 31 to March 27.)

(14 Mc. phone.)

CE3DW; CT1AY; F3NF; F8W; G5BJ; G5IN; G5ML; G5NI; G5PB; HC1ETC; HK1AG; HK1DG; HK1GK; HK3JA; HK3RC; HK4EA; HK5ABC; KA1DL; LU1QA; LU4AK; LU5CZ; LU6KE; LU7AZ; LU9BV; OA4AB; OA4AK; OA4C; OA4N; ON40K; ON4ZA; PA0MV; PK1MX; PK1VM; PK3GD; PK3LC; PK3ST; PK3WI; PK6CI; PY2CK; PY8AD; SM5SY; SU1CH — VK -2ABG; 2CP; 2GU; 2IQ; 2JU; 2OG; 2OQ; 2RJ; 2XU; 2ZZ; 3EG; 3GQ; 3GU; 3KR; 3KX; 3LI; 3MR; 3PL; 3RW; 3ZL; 4JX; 40B; 4VD; 5AI; 6MV; 7JB. VP2BC; VP3BG; VP4TH; VP5PZ; VP6TR; VP6YB; VP8AD; VP7NC; VP9R; YV1AC; YV1AP; YV5AA; YV5AZ; ZE1JR; ZU6B.

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THE QUESTION BOX

My transmitter causes a very unpleasant hum to appear on the carriers of incoming signals when I am standing by. It seems that the only way I can stop it is to turn off the filaments in the rig. When this is done the hum disappears completely, only to reappear immediately as soon as the filaments are again lighted. The rig is a three stage affair with an 03-A in the final. I am using resistor bias on all stages.

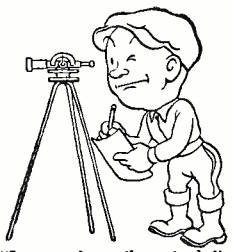
The trouble you mention occurs very frequently in transmitters that, as you mention in your last sentence, use straight resistor bias on one or more stages. The trouble is caused by the fact that during the standby period there is no bias on the tubes in the transmitter. Under these conditions any slight unbalance in the filament center-tap can place a very small a.c. potential on the tubes, which can cause the offending condition to exist. Especially is this true if the rig is slightly out of neutralization. The condition also can be caused by a very low voltage output from the power supply introduced in a manner similar to that described in the April "Question Box". The trouble, unpleasant as it may be, is fairly easy to eliminate. If a small amount of fixed bias is inserted in series with the grid return of each stage that previously used straight resistor bias, the interference will in almost every case immediately cease. A 22½ volt B battery, by-passed by a .01 μfd. mica condenser, in series with the common return to ground of all the resistor biased stages will serve as a quite effective cure.

"At Last . . . . a QSO"

Yes, sir, the rig must be completed sharply at 7:30 p. m. The wife bets a dime that it won't be ready 'till tomorrow. Little do these women know how determined a ham can be when it comes to wiring up the last stage of the transmitter. The oscillator is put together beautifully, every wire is precisely in its proper place . . . the solder is as smooth and as slick as the job the man from the telephone company does when he solders 'em together for the boss to see. Every component is squared-up; the oscillator stage is a treat for sore eyes.

You pat yourself on the back, and the dust flies off your old musty shirt. The buffer stage comes next. You look at the clock. Migawd!—only one hour to go before the dx rolls in from Europe; sharp at 7:30 the reports say. All the other hams are working Europe. I've got to work Europe, too. And won't I give them the laugh when I get an R6 report, and they only get an R5 or a 5½!

Got to make time. Put the buffer stage together more quickly. The solder is a bit heavier on the splices, and the parts aren't just in line, not when you look at them through a transit, but that doesn't matter. The stage tests OK. The thing "buffs" nicely and the sparking pencil is alive with fireworks. What matter it if a few of the parts are not just in line with the others? The thing goes into a box, later, and nobody's going to lift up the lid, or look in back of the panel, and square-up the parts with a T-square. Then, too, the guy who looks at it may be a bit cock-eyed, so it doesn't matter. The thing that counts is the cold, cruel fact that Europe comes in at 7:30 and Europe has a habit of slipping out of the picture just as nicely as she rolled in.



"Lower the coil an inch."

Jeepers, only a half hour to go!

The final stage . . . with that new tube to top the works,—the thing I handled with gloves ever since I bought it. Where'll I put the thing? The chassis isn't any too large. A big condenser has to go there . . . and a neut condenser there . . . . and a grid coil there . . . *where* will those things fit? Can't waste too much time. Europeans coming in soon. 20 is hot tonight. Throw the final together. Doesn't look as nice as the oscillator, by a long shot—not half as good as the buffer stage. Big gobs of solder on the wires in the final. Crooked leads run everywhere. A rat's nest under the chassis. Keep your fingers out of it, or you'll get electrocuted!

Final tank condenser, darn it, hangs over the end of the chassis by two and a half inches. Ugh! That looks lousy. Can't help it, though. Tank coil lopsided, but the center-tap is in the right place, so it doesn't matter. Neutralizing condenser hangs on to something by nothing more than friction. 'Fraid to touch it too often, or it'll fall down. What a mess! And the oscillator stage looks so beautiful. Why didn't I wait 'till tomorrow night and take my time . . . do a decent job of the whole rig? What saps we hams am.

That final stage! Sure have to hide it in a big box, or the hams all over town will ride me to death about it. I'll show 'em the oscillator only, when they come to waste my time and smoke my cigarettes and borrow my spare tools, and ask me if I can spare a couple of sockets and things. They'd also have brought the cake for the coffee, only the bakeries were all closed, so will I please have the wife brew the coffee and how about a doughnut, or a pretzel, or a piece of pie, or a snail or a . . . snake, or darn these chiseling hams! The only time they ever come to my joint is to get some free lunch. Bet the whole town will turn out tonight to see my new rig . . . . just because the final amplifier looks like something I forgot to finish. The irony of it!

Got to get it ready in a few minutes—Europeans almost ready to bang in. Can't waste no time a-tall! Went to grab for a piece of hookup wire and reached for the hot end of the soldering iron instead, my eyes glued to that final amplifier, of course. Burnt two fingers nicely. That doesn't matter; I use a bug, so skip it.

Have to drill a hole through the chassis . . . another wire has to go up topside. Drilled like a hungry termite. Right through the chassis and also right thro' the mica bypass condenser, where a hole should never go. What luck! No spare condenser around. Now what? Into the junk box . . . grab four small con-

densers . . . hook 'em all in series. How they look! But they will work, and Europe will soon be coming through.

Ready for the juice. Dang that milliammeter . . . it's sticking again. Tap it with a screwdriver, and the glass busts! Oy, now it will never read again. Aw, what the devil . . . . don't need a milliameter, anyway. Color of the tube will tell how many watts are being pumped.

Upstairs into the radio shack with the thing. Get it on the air, somehow. Slip on the steps going up . . . gosh, that was a close shave. Did nothing more than tear a nice slit in my trousers. Aw, they only cost a quarter as much as a new tube, so what? Lucky the tube didn't bust. That's all that matters tonight. You can go around town with a hole in your pants, but never, never with a hole in your tube.

Finally get the contraption on the radio table. Set it down on a box of matches. The matches ignite; smoke comes out from under the chassis—I scream! It's only the smoke from those burnt-up matches. Whew! The set is intact. Watta scare. And Europe only 15 minutes away.

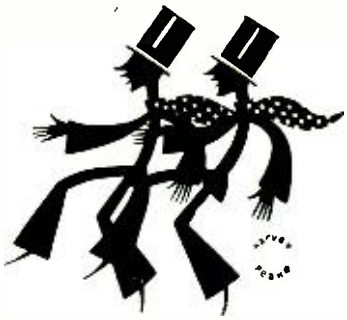
Hook the lead-in to the final . . . lead-in a bit too short . . . pull on it, easy now! Rats! Wait 'till I lay my hands on that ham who said he soldered it to the antenna, just the right distance off center. Up on the roof, down with the s k y - w i r e. Yep, there's where it was supposed to have been soldered. Lucky for me, the moon is shining and I can see that nice bright spot on the antenna wire where the lead-in wire should have went. So back went it.

Connubial QRM

Down into the radio room. Almost ready for the air. What a feeling! What a sensation. What a life. Great to be a ham. Wife gone to the movies . . . can't razz me if I don't raise somebody in Europe. I can lie to her tonight, for once.

Hope she don't come back 'till twelve. Maybe she'll stay for two shows. The Butterfly Boys are featured tonight, and it's chinaware night, to boot. Hope she drops the crockery on the way home. It always grates when you rub your fork on the stuff.

Murder! She swiped my only pack of cigarettes, and how can a guy work dx when the fags ain't there? I'll die before midnight. Maybe some ham will drop in. Aw, skip it again . . . . they don't bring smokes with them, they come here to smoke my smokes! Only thing a ham ever brought to my house was a spittoon for Christmas . . . so he could practice while I tuned over the band. I finally got tired of seeing him practice, so I moved the spittoon away, for fear he'd spit in the darned thing, sometime.



The Butterfly Boys. Bless Their Hearts

Europeans due on the air any minute now. Hooked up the transmitter in nothing flat. Lots of radiation, lights in the house glow brighter every time I press the key. Why buy juice? Turn off the light switches and make my own lights, free. Juice all over the neighbor's house, too. Touch the water faucet and the old grouch next door will get her fingers tickled. Fire water, yes?

Hope the baby isn't in the bath tub when I press the key. I'd have to get the neighbors another baby.

Europe due in less than half a minnit. Funny how them fellers come in right on the dot, or they don't come in at all. Not supposed to call CQ. Europeans don't answer CQ's. They do the CQing themselves. Nice boys! Makes life easier for us over here. All we do is listen, and ten thousand of us see who can reach the key first and come back at 'em all at once. None of them would ever think of letting the other ginny get a crack at Europe when *they* can do the cracking themselves.

Lawsy, what QRM, what QRM. There's a European, bless his soul. Yep, that's *him* . . .

[*Continued on Page 75*]

The Not-So-Gentle-Art of Working DX

By Dave Evans,* W4DHZ

"How to Snag Dx and What to Do with It After You've Got It" is a question that bothers most beginners and not a few old-timers (especially the first part of the question). Here are some first hand pointers and hints, the kind of trade secrets that most dx men are reluctant to divulge, offered by a well known dx man and winner of the 1936 dx contest.

"I have 250 watts on 20 and 40 meters, a good antenna, and still I haven't been able to work but 11 countries in the last six months. How does one go about working all this dx some of the fellows snag so easily?"

The questions may vary, but not the frequency with which I receive them. Every so often a newcomer, and occasionally an old-timer asks me if I will divulge to him the "secret" of working dx. Inquiry has revealed that most every dx man that has a wide circle of acquaintances receives the same questions. Now most any of these experienced dx men could give some good advice and pointers on hooking elusive dx, but as none yet seems to have done any enlightening on the matter in print, I have taken it upon my shoulders to try to help those suffering either acute or chronic "dx deficiency".

At the present stage of the game it is no longer a feat to sit down of an evening and work a few dx stations. But as the amount of time most of us spend on the air is limited, the important consideration in piling up a *lot* of dx is the ability to work it with a high degree of efficiency. By "efficiency" I mean the ratio of dx stations worked to the time spent on the air (both listening and calling).

A station with good "dx efficiency" will show a very high percentage of successful calls. The operator does not waste a lot of time on needless or futile calling. About a year ago my average at W4DHZ was over 90 per cent when calling Asia, a very hard spot to work from the fourth district. This was because I spent my time calling *intelligently* and not *blindly*. Listen to the boys who have worked over 100 countries and 35 zones; you will seldom hear them making a lot of unsuccessful calls. Instead they spend the time *listening* to what is going on and figuring out their "plan of attack" so that when they do call they will probably snag the station.

A lot of the fellows using relatively low power feel that their chances are slim compared with the "kilowatt gang". It is true that if you are using 100 watts and there is kilowatt station smack on your frequency you will have difficulty in working dx while the other station is on. But with a channel clear enough that a selective receiver will bring you in QRM free, there is no reason why with the same antenna and under the same conditions you cannot work 95 per cent of the stations the kilowatter is able to work. The reason for this is that a signal *usually* is either getting into a certain location or it is not. If it isn't, all the power in Boulder Dam and all the tea in China won't put a signal in. And if conditions are such that signals are getting through to the location, 100 watts in a *good antenna* will do the trick in the majority of cases.

And 100 watts is certainly low power, even if it were not considered so a few years ago. Anybody who runs less than 100 watts to a pair of 210's nowadays on c.w. is either ultra-conservative or a sissy.

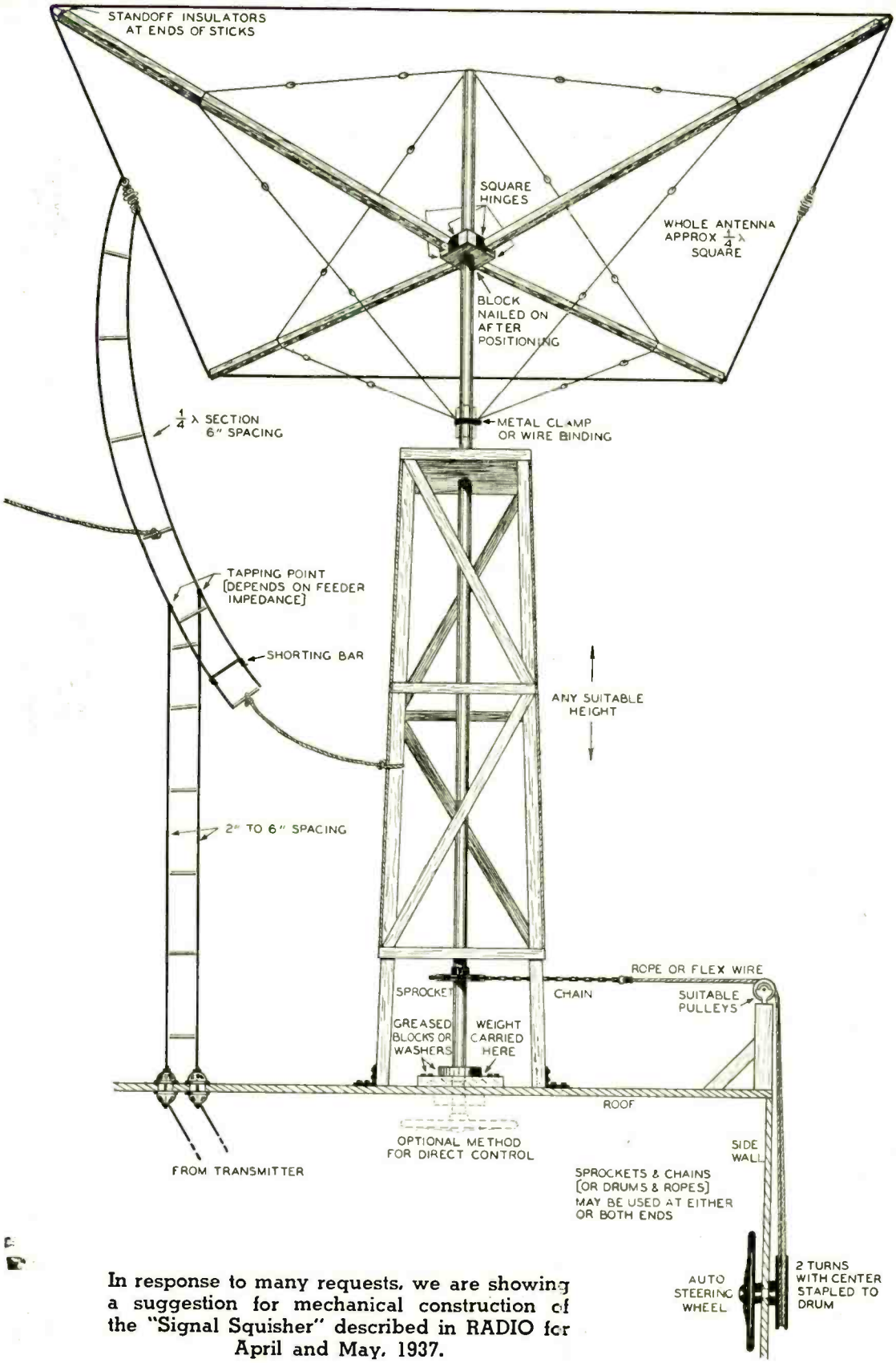
So if your 100 watts won't get out the way you think it should, don't waste time bellyaching about the Kalif Kilos stealing all your dx. Spend the time putting up some good antennas instead.

Last fall as an experiment I played around with low power and worked out quite consistently with 25 watts input to an 802, and averaged R7 for a w. a. c.

So, to sum it up, we can say that while power may help, it definitely is *not* the answer. The operator, antennas, and receiver are of much more importance. After building or purchasing a good receiver and putting up the best array of sky wires your purse and the available room will allow, the next thing is to give some attention to yourself.

To be a successful dx operator you must study the habits of the gang across the sea just as carefully as a big league pitcher studies the man facing him at the plate. For instance, about 65 per cent of the foreign stations tune from the ends of the 14 Mc. band, and on 7 Mc. the average is about 75 per cent. Let's sit in on an evening of 14 Mc. dx and see how

* 132 Leslie St., Atlanta, Ga.



In response to many requests, we are showing a suggestion for mechanical construction of the "Signal Squisher" described in RADIO for April and May, 1937.

an intimate knowledge of these "habits" assists us in working elusive foreigners.

The ole rig is all fired up on 14,398 kc. (with a crystal that drifts *into* the band if it drifts at all) and the band sounds pretty lively. Here is EI8B coming through, and almost invariably he tunes from the edge nearest his own frequency. When he finishes sending "test dx" and signs, just for fun I take a quick jump to my own frequency, and momentarily check to see if any of the other "edge" stations are calling him. Yes, there are about a half dozen stations frantically calling. So we call him only six times and sign, while the other stations are just getting warmed up to their work. Needless to say he comes back to us. So we go ahead and have a short but interesting rag chew with him *while three of the other stations are still calling him.*

Finishing with EI8B, we listen on our own frequency again and hear our "Kilocycle Neighbors" calling our good friend Ivan, VK3EG. Knowing the frequency Ivan usually "inhabits" from previous observation, we give him a short call and sign while the others are still calling him. Back he comes. He doesn't want to sit around listening to his own call repeated half the night; what he wants is to work someone. And too, he knows that an operator who shows signs of being wide awake by giving a short snappy call usually makes a more enjoyable QSO. Possibly W4QSZ's signals were getting in an R louder than ours, but he has a habit of wearing down his dx by the time he gets around to switching over.

There is ZB1C, and he seldom tunes from the 14,400 kc. end. So we QSY to 14,300, close to his own frequency, and call him 10 or 12 times. We have to make our calls a little longer now that we are not right on the edge, to give stations a chance to locate us in the band, but no five minute calls without ever a listen to see if the called station has already picked us up.

Being able to QSY in a hurry is of prime importance. Two years ago during the dx contest I heard ZB1C call "test dx" and gave him a short call on 14,398 k.c. Nothing doing, so the rig was quickly shifted to 14,300 and another call made. Back he comes.

Knowing the most-used frequency of a dx station is a great help in working him when other stations are heard calling him but the dx station was not heard calling CQ. Some amateurs consider the calling of a station under these conditions unethical, but it is certainly not illegal, and if done *intelligently* should not be frowned down upon as unsportsmanlike. It is one of those things that make working dx all the more interesting. Playing poker wouldn't be half the fun if one were not allowed to bluff once in a while.

If we know the frequency of the station we want to "steal", we know which of our own crystals to use and also where to listen for the station after we have finished calling him. U. S. A. stations need several crystals to enable them to dodge QRM and "maneuver" for dx. However, most foreign stations have a "pet" frequency and stay pretty much in one place. There are a few exceptions, and it is foolish to attempt to "steal" one of these wandering dx stations as one would not know where to look after finishing a "semi-blind" call.

Incidentally, it is most certainly unfair and usually unprofitable to call a station without first hearing him unless you have some assurance that you *will* be able to hear him if he should come back to you. You have heard him before, or you would not know his probable frequency. Therefore you know your receiver will drag him in if he is getting through to your location. To make sure of the latter, do not call him *unless other stations in your part of the country are heard calling him.* It would be foolish for a W6 to call OK2AK just because he heard a W2 calling him and knew the frequency Hans would probably be using.

If a dx station divides his time between two frequencies, one at each end of the band, a clue to which frequency the dx station is using can be gleaned by noting on which end of the band there are the most U. S. A. stations calling him. Most any dx station worth snagging usually has several stations calling him from North America. If most of the stations calling him are on the high frequency end of the band, we put in our high frequency crystal and listen on his high frequency when through calling him.

Some amateurs are sure to challenge this practice, but so long as it is being done by a large number of amateurs anyhow and nobody can deny that it produces results, it looks like the logical thing to do is to accept it as good operating and thus remove any stigma that might at present be attached to the procedure.

Another exemplary incident of the 1935 contest: I heard a local station calling PK3BX on 7 Mc. Asian contacts being scarce as hen's teeth on that band from this district, especially

[*Continued on Page 77*]

Erecting a Bruce Folded Array

By Dwight E. Harkins,* W6BUQ

After some nine years of amateur radio, the writer has had increasing difficulty as the years went by in having successful QSO's with low power equipment. This sad state of affairs gradually became worse until it was impossible to have a decent QSO on 20 meters either on fone or c.w. Now no ham is a real ham if he will put up with a condition like this; so it was resolved that something must be done immediately to cure our troubles.

There were three possible roads to take: the first would be to increase power, the second to put up a good antenna, and the third, to give up amateur radio and take up stamp collecting or knitting. Although I have planned a high power station for some years, it never has materialized for some reasons common to most hams. A modern antenna was never erected because it was not fully appreciated just how important an antenna is to the amateur station. Being afflicted with an incurable case of chronic hamitus, it was impossible to choose the latter road and give up amateur radio.

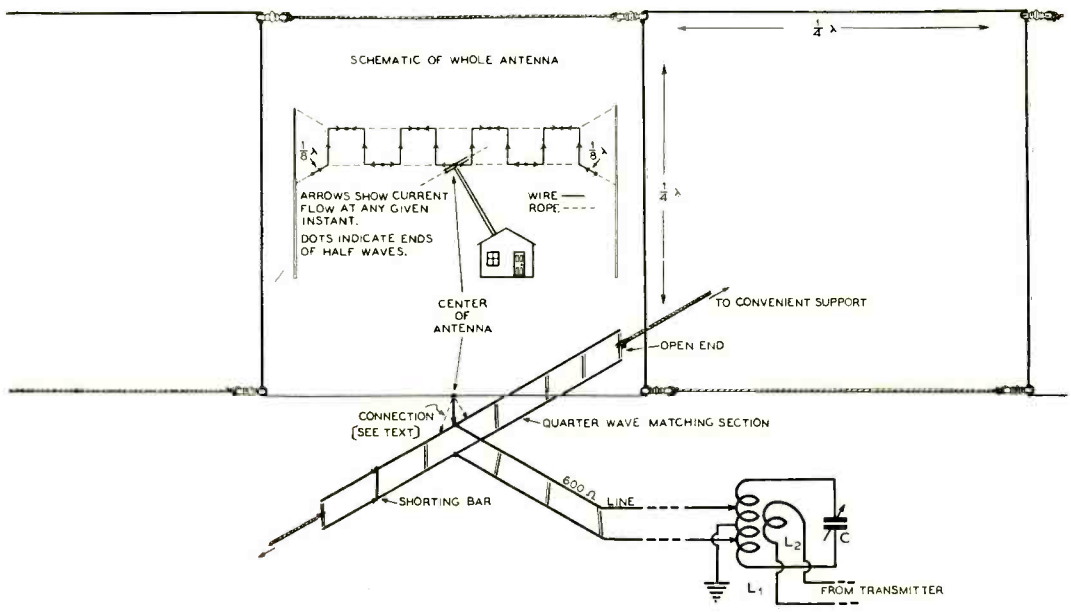
Not being in a position to buy new equipment, I started investigating the antenna situation. I was confronted with the problem of picking a suitable antenna out of a batch of several dozen. It was finally decided to put up a distinctive array so as to get an effective gain in signal strength even though it was only in certain directions. After reading the Radio Antenna Handbook from cover to cover I was in a quandary as to what type of a beam to erect. Among those considered were the diamond, various half waves in phase, the "vee" beam, a dipole with reflector, and lastly the Bruce folded array. The diamond occupied much too much space, and the half waves in phase would also require too much space if enough were erected so as to provide an effective gain. The "vee" beam occupied too much space, and the half wave with reflector did not offer enough gain. And so the Bruce Array was selected because it could be mounted in a reasonable area, it appeared to offer the required gain, it would not cost much to assemble, and lastly because I did not have any first hand report as to whether or not it would really function and if nothing else was accomplished I could at least give it a try and pass the word along as to my results. The results were sensational! Hence, in this article I hope to pave the way for many more hams to see how simple and worthwhile it would be to erect an antenna along the lines I shall proceed to give.

* C/o State Theatre, Tempe, Ariz.

Assembling the Antenna

The following dope is for 20 meter operation; for ten meter operation divide the measurements in half. This antenna is designed for the center of the 20 meter band or 14,200 kc. and will function with equal efficiency over the entire band, both c.w. and phone portions. In figuring the length of each quarter wave section, the wavelength in meters is divided by four, then multiplied by 3.28 to give the number of feet. In the conventional straight wire antenna this length would then be shortened, but in folding a long wire antenna the natural frequency is increased, which would make a longer length necessary for any given frequency. Hence nothing is deducted.

For 14,200 kc. the quarter wave length is found to be 17½ feet. I then made a measuring stick 17½ feet long with a mark at the half way point. The next step was to roll out 300 feet of wire No. 12 on a nearby vacant lot and then thread 18 small strain insulators on to the wire. One of the insulators is immediately fastened to the end of the wire in the usual manner. After this, measure 8 feet 9 inches from that point (half way on the measuring stick) and attach another strain insulator. This is an eighth wavelength section. From this insulator measure a quarter wavelength section (full length of the measuring stick) and attach another insulator by giving it several twists. This process is repeated until you have a total of 15 quarter wave sections. The wire is not broken at any time. Then measure off an eighth wave section, clip the wire left over, and attach the last insulator. You will now have an eighth wave section followed by 15 quarter wave sections followed by another eighth wave section, all one piece of wire, with the insulators at the end of each section.



The wire as it now stands is then laid out on the ground in about the same pattern it will occupy when it is hanging in the air (see illustration) and the assembling of the rope sections is begun. Use clothesline rope that is small enough to be forced through the strain insulators, and of the wax impregnated variety that can be purchased at most any hardware or 10c store. The rope lengths are then tied between the insulators as indicated by the dotted lines on the illustrations. These lengths are also 17½ feet, although we actually made the lengths a few inches shorter to allow for stretching as the antenna hung in the air. There are seven quarter rope sections. The antenna is now ready for "hanging." It took another ham and myself about two hours to do all this assembling.

The antenna can be hung between any two points at least 135 feet apart in such a manner that the bottom of the antenna is at least 8 feet above ground and so that the radiation broadside in either direction is where you want it.

Feeding the Antenna

The array is fed at its center by a quarter wave matching transformer which consists of two number 12 wires 16½ feet long spaced 8" and mounted in such a manner that the point where the 600 ohm line is connected will approximately intersect the center of the array. The 600 ohm line is connected at a point 9 feet from the open end and the shorting bar about 2 feet from the other end. The center of the antenna is connected approximately to the same point on the stub as one of the 600 ohm feeders. The antenna is not broken but merely bound to the one side of the matching transformer at the same point where one of the 600 ohm line feeders connects to the matching transformer. In some cases slightly improved operation will be obtained by connecting the antenna a slight distance either side of where the feeders connect to the stub.

By consulting the illustrations it is clear that the antenna is not broken, and that it is connected to only one side of the matching transformer.

The 600 ohm line (two number 12 wires spaced 6 inches) is run about 100 feet into the shack and connected to a coupling coil which is in turn tuned and coupled to the transmitter by a link line. (See diagram.)

While the last connections were being made the transmitter was allowed to warm up, as we were getting in a rush to give the antenna a try-out. A short CQ was rung out on 20 meter phone, and lo and behold, at least five east coast hams were calling W6BUQ, which was unusual for the time of day (3 p.m., m.s.t.). One of them was QSO'd and after receiving an R7 report on the array we immediately changed back to the old antenna (a voltage fed Hertz). The result was that we were not heard

at all with the old one. Then the fun started. For three hours steady we held one QSO after the other with east coast stations without so much as a "QRZ?" at the end of each contact. With each contract the same test was made and the results coincided (from R 6-8 on the array and nil on the Hertz). This was just the test from one side of the radiation. The antenna is mounted in a line 10 degrees west of north and 10 degrees east of south, making the radiation 10 degrees north of east in one direction and 10 degrees south of west in the western direction.

It was necessary to hold operations and QRT for supper and work as it is impossible to get on the air while the theatre is in operation (the shack is located right next to the projection booth of the theatre).

With the same thrill that accompanied my first QSO years ago, operations were again resumed at 11:00 p. m., only to be confronted by a band that was completely dead as happens on 20 meters quite frequently. Not to be discouraged, we wired in a switch to throw the antenna onto the receiver so as to use it for both transmitting and receiving and immediately we began to hear the VK's rolling in on fone very nicely at about R6-7. After tuning around we heard VK3EG coming in R-8 and decided to give him a call. A short call raised him. He told us we were the only U. S. station coming through on fone. We received R-7 and were so excited that we forgot to make the test with the old antenna.

Within the first 60 days of operation we worked 29 Australian stations on phone with no report less than R-7, and six R-9 reports. All of this with only 48 watts input! None of these stations would have been worked had it not been for the Bruce array used in connection with both the transmitter and receiver. Enough on the bragging. This article is not intended to tell you of my dx contacts but to show you how you can obtain the same results by spending a little time doping out an antenna best suited to your location and desires.

How It Functions

The whole basis for this type and other kinds of folded antennas is the fact that a half wave antenna radiates most of its energy from the quarter wave section at its middle. Thus it is possible to bend the eighth wave section on either end without effecting the radiation to a large extent. Now, considering the antenna as one long piece of wire, it would have eight half waves in it. Every other half wave would be in phase. By using the eighth wave on each end that is not necessary for radiation, the varied half wave lengths can be bent around so that the wire in the ¼ wave center of each half wave length is running in an opposite direction in comparison with that of the half wave either before or after it. Since the currents were running in opposite directions in the half waves of the straight wire as compared to the one preceding and following, the currents are now running the same direction at any instant in all of the vertical sections, which consist of the maximum current part of their particular half wave length. Hence the eight vertical sections operate in phase, while each alternate eighth wave lengths of the horizontal sections are in opposite phase. This produces a low angle vertically polarized radiation from both sides, broadside to the array.

Adjusting the System

In order to obtain the best points of connection on the matching transformer, the shorting bar and point of connection of the antenna to the transformer were varied while the readings of a signal strength meter were watched. The signal strength meter was located about 200 feet from the antenna and consisted of a 0-1 ma. hookup with a '30 tube as a diode, and a tuned coil with about three feet of antenna. The connections for maximum reading were given earlier in the article and were found not to be the least bit critical.

The installation of this antenna at W6BUQ has brought many wonderful QSO's and a comforting feeling that I can work anybody I can hear without making the light meter spin like a fan. This array will put the low power ham on an equal footing with his more fortunate brothers, and make the high power ham the "king of the air."

For receiving purposes, the gain offered is such that it is often the difference between copying the other fellow and not hearing him at all. In fact I would recommend installing the antenna for receiving purposes only, if a **good receiving antenna is necessary. If your** location will not accommodate the required 135 feet, you may use either six or four half wave lengths instead of the eight and still have a worthwhile gain over a conventional antenna.

My advice to any ham is to *put up a beam antenna.*

Negative Feedback Applied to Class B Audio

By Leonard L. Nalley,* W6CLL

Distortion in a class B audio amplifier or modulator is almost entirely due to distortion in the driver stage. However, variations in load impedance, overloaded or unbalanced driver-to-class B grids transformer, and the class B output transformer and choke, if used, each contribute their share. Poor regulation of bias and plate supplies usually increases distortion only below 200 cycles.

The most serious distortion comes from variations of load on the driver stage. In figure 1, a generator Z with internal impedance R_p develops a voltage E_0 which is dissipated across R_L and R_p. As R_p *decreases*, the voltage E_1 becomes more nearly equal to E_0. That is, the generator regulation improves and the voltage E_1 is more nearly independent of R_L. If R_p=0, then the generator will have perfect regulation and the value of R_L will have no effect on the value of E_1. Practically all that can be done is to select a driver tube with low plate resistance, and then to make the R_p:R_L ratio as small as is consistent with enough grid swing on the class B grids.

The grid resistance of most modern tubes, especially those of the zero bias type, is low but uniform throughout the useful part of the audio cycle. Many of the older type tubes, 204A, 849, 203A, etc., have very undesirable grid-impedance characteristics, rising from a value of a few hundred ohms on the peak of the positive cycle to an almost open circuit on the peak of the negative half cycle. This leads to a poor transfer of power from tube to tube and increases low signal distortion. Often the grid impedances have sharp breaks in their ever-changing resistance values — sometimes even negative slopes and then secondary emission characteristics are found. These latter two are frequently the cause of spurious oscillations.

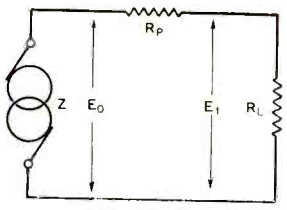


Figure 1

Added to the difficulties caused by these tendencies to oscillate, variations of grid impedance cause non-uniform loading on the driver stage. A pair of good triodes working into their rated load of 4000 ohms or so may deliver a beautifully clean 15 watts or more. These same tubes very likely will not deliver this same power into 2000 or 8000 ohms at anywhere near such good quality. Of course, the lower the plate resistance of the tubes, the less will be the distortion produced.

If a class B amplifier is to have quality on par with the input, oscillation within the amplifier must not be allowed. These oscillations may be transitory, intermittent, continuous, or they may assume some baffling form that does not have rhyme or reason.

Oscillation that stops during heavy modulation is usually traced to leakage inductance in the driver grid transformer or in the driver plate to class B grids transformer, or to magnetic coupling between the two.

If oscillation is transitory, during the positive swing of each class B grid, the trouble is usually due to tubes with negative grid slope characteristics. A shunt resistor, condenser, or a combination of both will tend to reduce or even stop this type of trouble. Figure 2 shows some convenient swamping methods. A class B amplifier should always be taken as guilty until proven free of oscillation.

Usually, loading of the class B grid transformer is needed only at the higher audio frequencies. Therefore, by making C and R small, it is possible to stop oscillation without losing too much power at the important lower frequencies.

After the class B amplifier is stable and in correct adjustment, a little inverse feedback will remove much distortion, hum, and noise, in addition to improving the frequency response.

The method of applying the feedback is simple. The only requirement is that the driver grid transformer have two leads brought out for the center tap. A portion of the output from the driver is returned to the driver input circuit in such a manner that it is 180° out of phase with the signal. Due to the fact that this feedback is in series with the signal, there is degeneration. Figure 3 shows the values for an 845-849 class B modulator. Modifications to meet other tube lineups should be easy.

The amount of feedback required can be calculated. The minimum amount is:

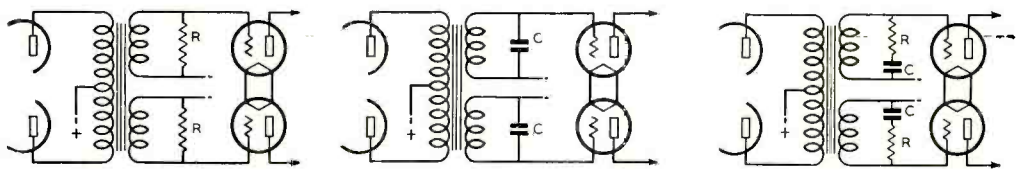


Figure 2

R—5000 to 25,000 ohms. C—.002 to .0001 μfd.

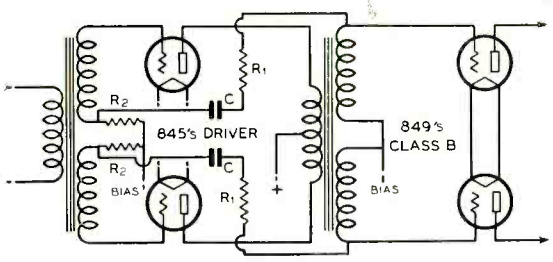


Figure 3

R_1--40,000 ohms C--0.1 μfd. 400 volt
R_2--20,000 ohms tubulars

1. Keep stray capacities low.

2. Be sure that R_1, C, and R_2 are connected exactly as shown.

3. Use caution when tuning up; wrong phase and the amplifier will oscillate dangerously.

4. If the amplifier does not oscillate strongly when not phased correctly, there is not enough feedback.

With some transformers it may be necessary to use further loading to make the amplifier stable. This is accomplished by placing small resistors or condensers across the driver grid transformer. As the phase shift that causes this instability is not bad except at the extreme high frequen-

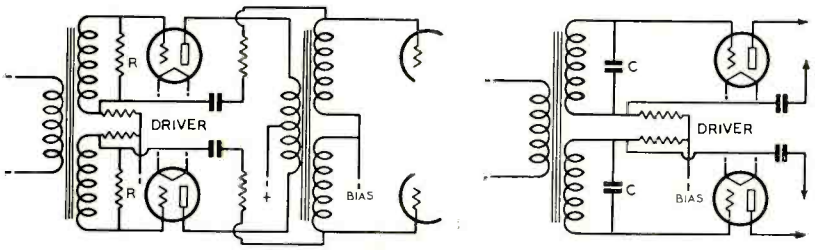


Figure 4

R—50,000 to 250,000 ohms. C—.0001 to .002 μfd.

$$n = \frac{1}{\mu}$$

n = the fraction of output returned to the input

μ = the amplification factor of the driver tube multiplied by the driver transformer ratio (Plate : ½ secondary)

Due to loss in the transformer and the plate resistance of the driver tube, it is usually necessary to use about twice the calculated feedback

The ratio of R_1 to R_2 determines the feedback:

$$n = \frac{R_2}{R_1 + R_2}$$

If it is desirable to compensate for poor low frequency response, the coupling capacity C can be made small in order that there is little degeneration at the lower frequencies. By use of band pass filters in the feedback circuits, special effects can be obtained.

The most important precautions are these:

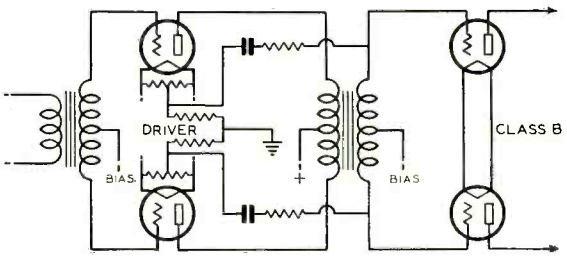
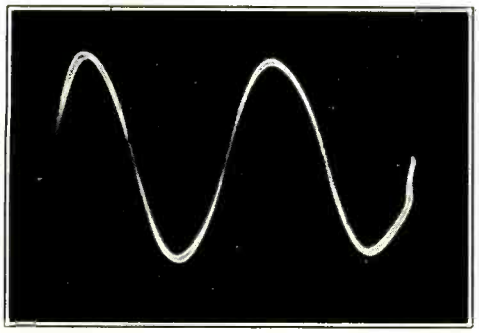
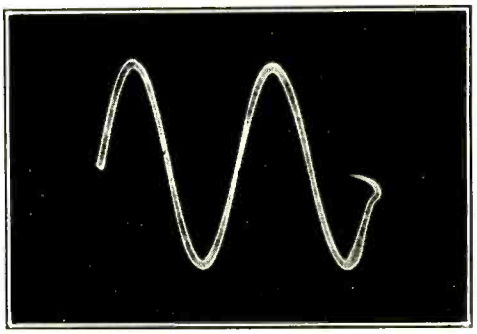


Figure 5

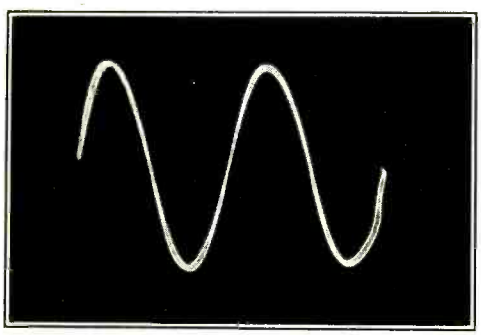
An alternative circuit for use where the driver grid transformer does not have two leads brought out for the center tap may be useful, depending on tubes and circuit constants. NOTE: The phasing may not be as shown above, so try a reversal to make sure that the feedback is negative. Make R_2 as small as possible and still secure enough feedback or large enough to furnish bias for the driver tube. Experimentation will be necessary in every case.



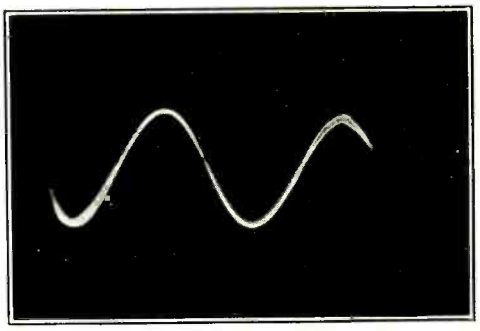
50 CYCLE OSCILLATOR



400 CYCLE OSCILLATOR



100 CYCLE OSCILLATOR



5000 CYCLE OSCILLATOR

cies, no loss of useful frequency response results in this type of stabilization. Figure 4 indicates the connections for this method of loading.

This degeneration results in but a slight loss of gain.

Inverse feedback in a class B driver stage results in a very beneficial reduction of driver plate resistance. A glance at figure 1 shows how this will lower distortion. This reduction of plate resistance is equivalent to shunting the internal resistance (R_p) with a resistor equal to $\frac{1}{nG_m}$

A few sample calculations and a glance at an oscillogram will convince you.

The amount of distortion with feedback can be calculated if the original distortion is known, but it is usually sufficient to go by the general rule that the improvement is proportional to the *loss of gain*; that is, if the *loss of gain* is 50 per cent, the distortion will be only *50 per cent of the original.*

Oscillograms shown here tell their own stories. It is only fair to state that the 849 tubes used during the making of the oscillograms were practically worn out and usually the distortion with new tubes even without feedback is not noticeable on the oscillograph except below 100 cycles.

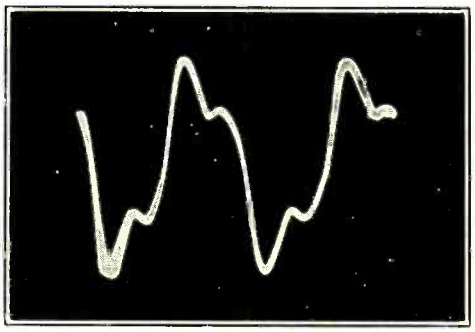
◆

Composition of Common Alloys

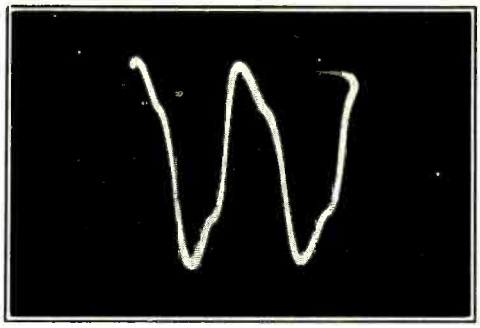
Copper is used in more well-known alloys than any other metal. A few of the more common of these are:

Brass--60% copper and 40% zinc
Bronze--66% copper and 34% tin
Aluminum Bronze--90% copper and 10% aluminum
Manganese Bronze--70% copper and 30% manganese
Phosphor Bronze--80% copper, 10% tin, 9% antimony and 1% phosphorous
Silicon Bronze--95% copper and 5% silicon
Gunmetal--90% copper and 10% tin
Manganin--82% copper, 15% manganese and 3% nickel
German Silver--52% copper, 25% zinc and 23% nickel

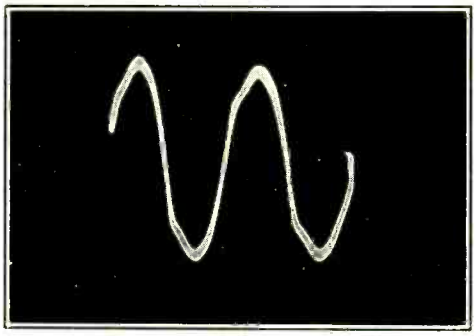
These alloys are not always produced in exactly the proportions shown above, variations often being required for special industrial uses. —*Courtesy Ohmite Mfg. Company.*



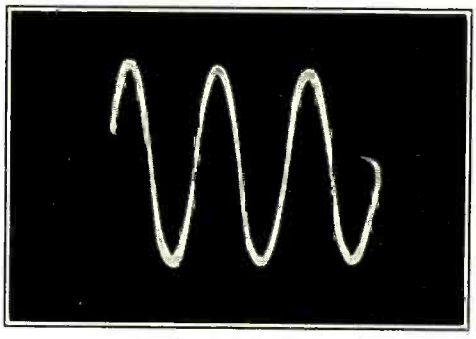
50 CYCLES, NO FEEDBACK



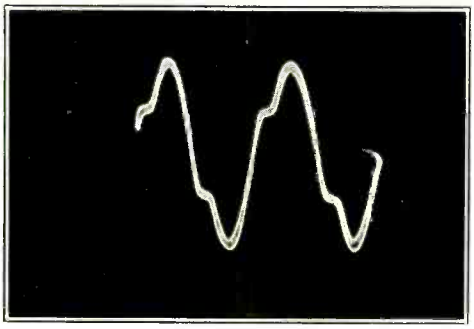
50 CYCLES, 20% FEEDBACK



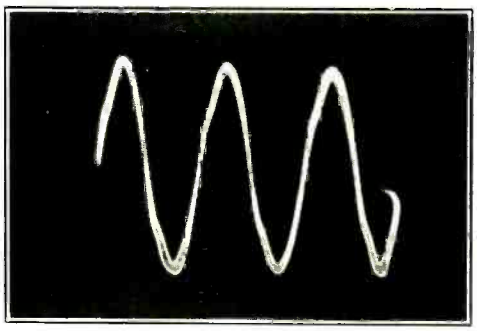
100 CYCLES, NO FEEDBACK



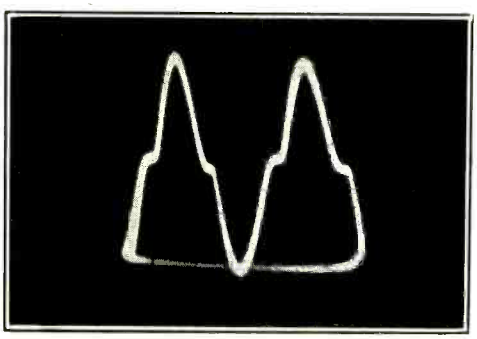
100 CYCLES, 20% FEEDBACK



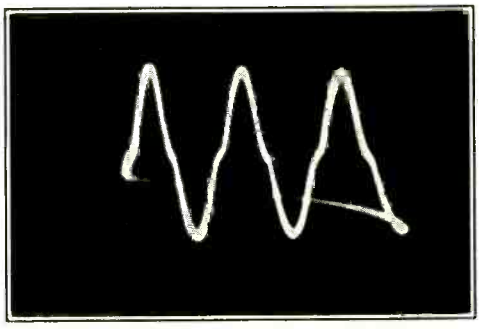
400 CYCLES, NO FEEDBACK



400 CYCLES, 20% FEEDBACK

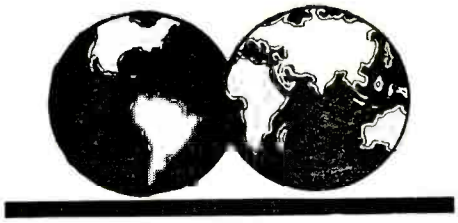


5000 CYCLES, NO FEEDBACK



5000 CYCLES, 20% FEEDBACK

DX



By HERB. BECKER, W6QD

Readers are invited to send monthly contributions for publication in these columns direct to Mr. Becker, 1117 West 45th Street, Los Angeles, California.

During the past thirty days dx has been rather mediocre; however, don't give up now as better days are comin'. From what a lot of the boys have reported around this world of ours dx just isn't what it should be, and what there is of it comes in when one doesn't expect it. There haven't been any peaks to speak of during the past 60 days, and nothing has worked out according to cycles. Why, do you know that instead of having a couple of peaks like CUH planned us to have (he would call that a bi-cycle, I guess) we have had about six medium sized peaks . . . just like a crystal I once ground. However, let's dive in and see just what we have.

Dear Herb:

Many U. S. A. and other foreign hams contacting ZL1's are not aware that there are two different power supplies in Auckland. When the Pan American Airways radio expert arrived in Auckland recently he was surprised to find that the district he had hoped to put up his station in was in the d.c. area.

Living in this area is no bed of roses for a ham who likes dx, and most of the d.c. gang sport rotary converters or, as in my case, motor generators. The boys whose pockets won't stretch that far, just plunk the 230 volts on a couple of small tubes and help make QRM. The local power Board figures to replace the power supply here with a.c. and hopes to have a.c. throughout Auckland "within the next 21 *years*" (Hi). Some of the boys figured it was cheaper and easier on the nerves to shift houses than wait 21 years. Stations active and located in the d.c. area are ZL1IL, ZL1KR, ZL1BE, ZL1HM, ZL1KS, ZL1LX and ZL1FT.

Stations calling these hams and others in Auckland should always allow a pause after calling, to enable the op to start the power supply. During the recent dx contest, lots of the W's had not the patience to wait and I for one, soon got fed up calling stations who had replied but disappeared.

Finally, the old horse is good for a number of years yet and the call ZL1FT will continue to percolate through the ether on 10, 20 and 40, and soon on 5 meters when a T20 tube arrives. Ask the eastern gang to look out for me on 14,334 kc. around 1420 e. s. t. Been getting some good QSO's over the long route.

Best of luck to you and RADIO, Herb.

73

NORMAN, ZL1FT.

ZL1FT is one of the real old timers in ZL and has been consistent over the years. He has given plenty of the boys a surprise when he discloses he had been using four 201A tubes.

W2GVZ has worked 31 Zones and has 85 countries according to the official list. GVZ uses an Eimac 300T in the final with a kw. input . . . And now W1IFK comes forth with a swell dx station worked YI2BA in Iraq. W1IFK was his first W QSO and the full QRA of the YI is as follows: Norman, care of Post Directorate, Basra, Mirgil, Iraq. When worked by IFK he was near 14,250 kc. and T7. IFK is using an HF-100 in the final and most of his time has been spent on 40 and 80 meters; he has only been on 20 for the past month, but has had exceedingly good luck in getting 20 zones and 52 countries. Some other stations for him include YL2BQ, YR5TP, YR5KW, U3AN, U2NC, I1IT, I1RCN and the usual bunch of Europeans.

W3AYS kicks in with a letter giving some dope about W3FAM. It seems that W3FAM is a fone man and has been on 160 until last October when he took a dive for 20. Since that time he has worked 21 zones and 36 countries. Some of his best dx so far is XU8HW, ZM2DI, PK1VM, VU2CQ on 20 and K7ESC on 160. Rig is a couple of 150T's in the final with a kw. As for 3AYS, he snagged VE5LD for his 34th zone.

Out of the mail bag pops a letter from W6GCT at Mission Beach, Calif., down San Diego way. GCT uses his kw. into a pair of Gammatrons. His QRA is supposed to be a honey and his antenna is eight half waves for 20 meters and runs NNE. It is link coupled to zepp feeders and most of the flat top runs over water. He has worked a whole mess of stuff scattered all over Europe, Africa, Asia, and points east. He lapses into a fone trance once in awhile and really goes to town . . . just look these over: F3KH, F8PU, G5SA, G2XV, G6LK, G5OX, G5SP, J2KJ, KA1AP, ON4BG, PK3GD, SU1SG. PK3GD boils thru R8 in the early a.m. on 14,020 kc. Henry says that when he was QSO G2XV last the Britisher wanted to know where all of the fone activity in the 7th district was. So I guess it's up to me to shake some of those 7's loose on fone. Can't some of you W7's get that mike out of mothballs and give those G's a break?

XX2JJ . . . and to all you fellows who want to know something about him. From numerous reports XX2JJ was a ship and generally gave the info that he was "about 500 miles SE of Porto Rico". Thanks to all the boys who sent in this bit of dope.

W9WCE is still using QRP and has no complaints. The rig is an 801 with 40 watts into it. Here's what he does with it: D4, CM, EI, F8, FB, G, HH, K4, K5, K7, LA, ON, PY, PA, VO, VP, VQ, VK, SM, XE, ZL, VE5OA in N. W. T. 9WCE says he got a stiff arm calling those K6's and knows just how those G's must feel about it, hi.

W4AZB in Jacksonville, Fla., has worked 26 zones and 70 countries and his final consists of two 150T's. Some of his best stations are YV5AN, I1IU, I1RRA, YR5CF, YR5AA, SM5QG, LA6U, HA5C. . . . W8LDR reports a few new ones for him on 14 Mc.: I1MH, I1IU, I1RCN, YR5CF, U3AG, U3AZ, U2NC and VE5RA on Resolution Island.

Italian Hams Receive Licenses

We are glad to list I1TKM in our WAZ Honor Roll. I1TKM has worked 31 zones, and incidentally if you fellows want to write him, you can address him directly in care of Associazone Radiotecnica Italiana, Viale Bianca Maria 24, Milano, Italy. Per-

"WAZ" HONOR ROLL

	Zones	Countries
ON4AU	40	
G2ZQ	40	
W6ADP	39	119
W8CRA	39	135
G6VP	39	
W8BTI	39	
W7BB	39	
W3SI	39	
W6CXW	39	
W4DHZ	39	
W6GRL	39	
W3PC	39	
W3ANH	39	
G6WY	39	
W6AM	38	
W6CUH	38	120
W8BKP	38	132
XE1BT	38	69
W9TJ	38	
G5YH	38	
W8HWE	38	
W9ALV	38	
W6LYM	37	82
W6GAL	37	107
W9PTC	37	103
W6HX	37	100
W6FZY	37	98
W6QD	37	97
W7AMX	37	100
VE4RO	37	
W2BSR	37	
W2GW	37	
W8DFH	37	
W2GWE	37	
W8OSL	37	
G6NJ	37	
W2DTB	37	
LY1J	37	
W8LEC	37	
W4AH	37	
W2HHF	37	
W6VB	36	
W3EXB	36	83
W1CC	36	99
W1ZB	36	100
W4AJX	36	
W8AU	36	83
W2AAL	36	91
W2GTZ	36	
W8KKG	36	
G6RB	36	
W9ARL	36	
W8KPB	36	
W9PTC	36	
W9KG	36	
W3EDP	36	
W2OA	36	
W6KBD	36	
W6DOB	35	71
W2BJ	35	105
W6KIP	35	95
K6AKP	35	
W6NHC	35	
W6GRX	35	
W8CJJ	35	
W2AIW	35	
W6EGH	35	
G6QX	35	
W3BBB	35	
W9EF	35	
W3AYS	34	
W3EVW	34	95
W6FZL	34	87
W9KA	34	
W8JK	34	
W3EMM	34	
W3EGO	34	
W2FAR	34	
W9PK	34	
W1AQT	34	
W7BYW	34	
W6ENV	34	
W6FKC	34	
W8AAT	34	
W6TI	34	
W8CNZ	34	
W8LDR	33	
W2IOP	33	
W9CWW	33	66
K6JPD	33	
W6BAM	33	82
W6GHU	33	
W6LDJ	33	
W9LBB	33	
W5AFX	33	
W9AFN	33	
G6CL	33	
W9LQ	33	
W6FKZ	32	74
W6JBO	32	81
W8HYC	32	
W3GAP	32	70
W6KZL	32	67
W8BTK	32	
W5EHM	32	
VE2EE	32	
G6GH	32	
W8OQF	32	
W6ITH	31	60
I1TKM	31	
K6CGK	31	
W3DCG	31	
W5CUJ	31	
W8DWV	31	
W3CIC	31	
W6HXU	31	
W6KRM	31	
W3UVA	30	76
W4MR	30	90
W9UBB	30	
W6HEW	30	
W2BXA	30	
W8MAH	30	
W7AVL	30	
ON4VU	30	
W7AYO	30	
W9PGS	30	
W6KWA	30	
W8DED	30	
W9IWE	30	
W6DIO	30	
W1APU	30	
W6LEE	29	
W8DOD	29	75
W6MVK	29	50
W3AWH	29	
W9LW	29	
W6HJT	29	
W8FJN	29	
VE5HC	29	
W3CDG	29	
W3TR	29	
W6CEM	28	62
W6GNZ	28	68
G6ZU	28	
ZU1T	28	
W6CGQ	28	
W5EOW	28	
W9JNB	28	
W3EYS	28	
W6GK	28	
W6KEV	28	
VU2LJ	28	
W9DEI	28	
W8HGA	28	
W6LHN	28	
W3CZO	28	
W8LZK	28	
W6LCA	28	
VK4DO	28	
W6JWL	28	59
PHONE		
W6AM	31	
W4AH	31	
W6ITH	29	45
W2HUQ	27	
W5BDB	27	
VE2EE	26	
W6BGH	26	
W6OCH	26	
W3SI	25	
W8JK	24	
W3EMM	24	
W6NNR	24	
W6MLG	24	
W6FTU	23	22
VE5OT	23	
W6BAY	23	
W6AAR	23	
W6LLQ	22	
W6OEH	22	
W7AO	22	
W9NLP	22	
XE1BT	22	
W9QI	21	
W3FAM	21	36
W6MVK	21	22
W1COJ	20	
W6GRX	20	

If you have worked 30 or more zones and are ready to produce confirmation on demand, send in your score of zones and official countries (see Jan. issue) on a postcard.

Phone stations need work but 20 zones, but stations must be raised on phone. Stations worked may be either c.w. or phone.

Revisions and additions to the honor roll will be made every other month.

haps you have wondered why so many "I" calls on the air of late. Well, they are now being licensed, so we will hear plenty of them from now on.

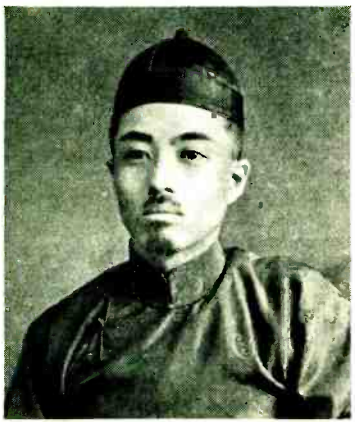
MX2B, Manchukuo

A few years ago, MX2A and MX2B raised quite a rumpus among the "dx hounds" by coming on the air simultaneously with the creation of a new country, Manchukuo. MX2A has since returned to Japan and only MX2B is left to represent Manchukuo.

The photo shows Mr. Takeshi Nagano, owner and operator of MX2B. Note that Mr. Nagano is wearing the official costume of Manchukuo, a silk frock and skull cap. However, we suspect that his beard and moustache were grown just for the occasion, for his subsequent photos reveal no traces of either. During his spare moments between his hamming activity he plays on his favorite instrument, the guitar. Mr. Nagano is 35 years old and is a native of Japan. He was among the first group of emigrants to settle in the new country where the winters are fierce and the summer heat terrific. The mountains are rich in coal and iron and copper ores as well as manganese.

MX2B is well known to W stations through the signal he puts into the United States. His dx is not confined to the U. S. A. alone, as attested by the cards on the wall. Being in a strategic location as he is, MX2B can cover both hemispheres with equal facility, and he reports making w. a. c. several times in one day on many occasions. He is able to work many rare ones that W stations never even hear. His active participation in various contests has brought him many certificates of merit.

The transmitter is crystal controlled and winds up with a 211-D in the final. As shown in the photo of the rig, the construction is typically Japanese, the various units being mounted on shelves projecting from the wall. The top shelf shows plenty of spare tubes for the final, ranging from a 199 to a ½ kw. Japanese tube. The receiver is a home built 4 tube t. r. f. job; a factory built superhet costs about as much as a fair sized dwelling in Manchukuo.



Takeshi Nagano, MX2B, whose fist is known to many dx'ers

If you haven't worked MX2B as yet, look for him on 14,220 kc. practically every day between 1800 and 2000 G. m. t. with a T9 note. Incidentally, MX2B always QSL's.

We are sorry to record this but it has been reported from what should be a reliable source that three well known Spanish dx men have been killed in the present civil war. They are EA4AO, EA4AB, and EA4BM.

•

W7CIK, Gordon (Shovel Ears) Turner, who is chief op at the CCC station WUBG takes time out to let the world know of his ham activities. Parts of his letter are as follows: ". . . have a poor location but manage to raise most anything I hear which isn't much. In my opinion D3FZI is the most consistent European on 20. Best S. A. stn. is LU4BH (it sounds like he is using a CKW). Rig here is pp 211's with 250 watts and a lousy superhette. Some dx worked is U1AP (is he any relation to B4UP?) OZ8E, PA0JMW, CX2A, ZU1T, ZU1AH, G2MI, G6GH, OA4AQ, LU4BH, CM8MC, HJD2, PA0QQ, PA0CE, PA0QL, XU3ST, VP5AD, TF3AG, CE4AD. Will be glad to pay correspondence expenses of anyone who can give me any dope as to whether TF3AG QSL's or not. Hi . . ." Well, that's his story and it's okay with me.

W6FKZ hooked a nice one a short time ago. 'Twas HZ2BE in Saudi Arabia. Had a d.c. signal and came in on 14,360 kc. That made Roy's 32nd zone. Another new one that many of the boys are reporting is TF3AZ in Iceland. The funny part of it is some of the gang won't believe that such a husky sig will come from that part of the world. As a matter of fact, to rest the minds of some of the skeptical, TF3AZ is using a kw. into two 203A's in a TNT . . . and he says, "Boy, do they run hot". Claims he will QSL all those he works when he gets away from there in November. There is still another TF coming through, or was anyway, who has just as much sock. He is TF3AG and is supposed to be G5NV up there using 150 watts input and a vee beam headed for W6. Says he is going to work his W6's a plenty, Hi. Frequency of TF3AG was 14,320 kc. Glenn Gauthier, W6VB, worked him and turned in this info. Oh yes, the time he was QSO with him he was between 0600 and 0900 G. m. t. That was 6VB's 36th zone.

More On OS1BR

This department has been running the pros and cons of whether or not OS1BR, whom so many have worked, is a foney or not. The newest development comes from W2GTZ. It appears as though 2GTZ had a QSO with OS1BR on May 8th (this year), at which time he asked him to explain why QSL cards sent to the QRA he had previously given, were returned with a bunch of cancellations and marked "Unknown". W1APA had sent a card to the address that OS1BR gave him, namely "Radio OS1BR in care of Suliman, Suez, Egypt", and had it returned. Now then, it seems that OS1BR told W2GTZ that Suliman is the name of an agent in Suez with whom he had made arrangements to handle his mail while he was in Hedjaz. Then he went on to say he was there in Hedjaz, Arabia, "prospecting" (but didn't say for what) and as soon as he gets back up "north" (wherever that is) he is going to mail out QSL cards to all that he has contacted. He further stated that he had been off the air for about seven months but expected to be on quite consistently this summer. Naturally, we hope he isn't kidding anyone, and this is all offered at its face value. There still exists a mystery as to why he uses the prefix OS when HZ is supposed to be the correct one for Arahia. You guess now, I give up.

While on the suhject of W2GTZ, we offer our apologies for leaving him off of the WAZ roll for the past three months . . . Really he was in there but no one knew it. It's like this: A few months ago W2GTZ was in there consistently and he sent in a change boosting his zones to 35. Well, at this point the printer must have had stage fright as 2GTZ's call was missing for the next three months, and in his place was "ZG1Z 35". For three months we wondered how this call got in there. Anyway o. m. Strock, who is W2GTZ, has 36 zones now.

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W8AU, Louis E. De La Fleur, who is chief op of the Utica, New York Police Department station, WPGJ, adds his bit . . . The rig he uses has an 838 in the final running at 300 watts. He has worked 36 zones and 83 countries. Louis is doing some 56 Mc. work and really is expecting to do big things on that band soon. He's hoping to pump a sig into ZS on 56 Mc. Good luck, and keep us informed.

W3GAP made his WAC in the contest by working YI5NN on 7 Mc. Does anyone know his QRA? GAP has 31 zones to his credit and 70 countries. W6GAL also an "ex-210 club member", is so busy with college that he hasn't had time to work much dx lately. However, he has 37 zones, the last one being SU1CH. George has 107 countries, the newer ones are EL2A, SV1KE, SU1CH, FY8A, FT4AG, CT1ZZ and CR9AB. For the boys who want to contact a station in Guam, W2AAL comes forth with K6OJG, who is located on the island. L. E. Benjamin, W4AJX, has been off the air this season due to illness . . . but by now we surely hope he is back on top feeling R9, and will soon get that sig on the air. He has 36 zones.

W9CWW got his card from HS1RJ and now moves up to 33 zones and 66 countries. W3UVA

has a few new ones in his log . . . EL2M, FT4AG, U9AF, U9ML, U9MF, U9MJ, I1MH, I1IR, I1TKO, FY8A, FY8B, FY8C, CP3ANE, HK4EA and YV5AN. W3GHB works J2CC with just a 40 meter crystal oscillator and doubling to 20 in the plate. W8NBK hooks VE5RA on Resolution Island. W7EUY, using a pair of 50T's, worked CP1AA for his 48th country . . . and now has 27 zones. W9NTW-OHK is doing all the operating due to his pard, W9SCW, getting married and now on a trip. Well, that's ok but I'll bet NTW will be doing the operating alone for some time to come . . . ho-hum!

YV1RV In New Hebrides

You can thank W9VLQ for this. He got his card back from the so-called YV1RV with the following information:

> "There is a bootleg station using my call and I think it is a W. I have had dozens of cards during the past year. My power is only 3 watts from dry batteries and have been off the air for one year QRL running commercial station FJZ on 600 meters."

This cancels all previous dope we have run regarding the frequency, etc. Someone must have had a good time for himself using that call but it's a dirty trick to play on the boys who try so hard to get that country and a QSL card.

Here's a note from our friend K6CGK. I'm just having a swell time copying letters from hams.

> "I note by the May issue of RADIO that the fellers are having quite an argument as to who has the greatest kilowatt. I refer to the arguments involving such calls as 9HP, 6KW, 6CKW, 6OKW, etc. I put in my claim of having "California's Greatest Kilowatt" or if you please "6 California's Greatest Killowatts" and so let's hope this argument is settled once and for all. The irony of it is that I have only a pair of 210's conservatively estimated to be at least 8 years old, thanks to K6AKP. My diamond beam extends over a pasture and I have QRM from cows getting tangled up in the guys at times."

W9KG reports that W9ZJB, W9ZD and W9AHZ had a big Sunday May 23d on 56 Mc. They heard east coast and W8 stations from 8 a. m. to 1 p.m. They also reported a lot of weak 10 meter harmonics. However, W9ZJB heard W8CXG and W8EGR on 5 meters, and W9ZD heard W3CQI. As for Keat, that's 9KG, he's moving to Weston, Mo., so off the air temporarily, although his other rig at W9ALV is still doing its stuff.

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W6HJT is on fone now and getting a kick out of it, I guess. Has worked 19 zones and some of the best contacts were with ZU6P, ZE1JR, PA0WV, VS2AO and VS7AK. W8ZV of Detroit worked U9ML and obtained his QRA . . . here it is Radio Station U9ML, Box 48, Sverdlovsk, U.S.S.R. W8ZV while QSO CP3ANE made a couple of tests with him. The CP started with 25 watts on an 802 and reduced power until he had 8 watts . . . 8ZV didn't miss a word . . . and the CP was on fone. CP3ANE is using a vee beam with 260 feet on each leg. 8ZV is using a Kraus (W8JK) beam and finds it to work great.

W9VOV is still using that little 6L6 exciter that was described in December RADIO. He uses it as his complete transmitter and vows that he will make WAZ on it or bust. He has only got started on the 14 Mc. band and is making fine progress so far, having worked a flock of real dx. For his receiver he says he is using "the most gosh-awful mess of knicknacks with 11 tubes scattered around it." If any of you boys want to hear a nice signal with flea-power, just keep an ear open on 14,376 or 14,012 kc.

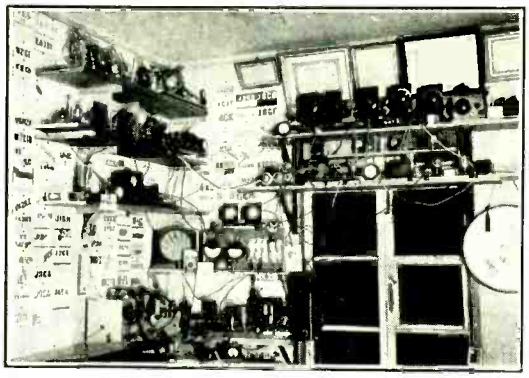
"Public Enemy No. 1"

This is a very interesting bit of news from a letter from our old stand-by, Dr. Robert Brzesowsky, XU3FK in North China. W6FMK, Aldo Bussi, received the letter which shows 6FMK did work some dx on c.w. at one time. However, he has forsaken the key for the fone and a little b. c. listening. On with the letter:

> To W6FMK, Dear OM:
>
> Just today came the April number of RADIO and with it the new "Bi-Push Exciter". I hope that you still remember our f.b. QSO's in 1935, in this time from Chefoo and therefore I am writing directly to you as a "Ham" adviser. Beforehand I must explain you, that with my old rig I had some troubles with the local authorities. On April 7th some 10 policeman called at my home and arrested my rig in a way as if they would fight "Public Enemy No. 1." Of course my "Pretty Boy Floyd" could not resist single handed against such a well-armed force and had to give in. No explanation was given. In the meantime I have written to the respective Minister at Nanking, but as usual in China, you have to be very patientsful before you get a reply, if you get one at all. Never mind the old rig, it was no good after all. So if I will get a new permission I intend to build up one of this new "Bi-push Exciters". I would like you to give me . . . . . etc.

Gee, I guess when the authorities make up their minds they don't fool around . . . just take ten cops and go get 'em.

Received a card from Hank Gould . . . ex-EL2A who is back at his home QTH in Akron again with his station W8BIS. He has some cards made for EL2A QSO's while in Liberia and they are quite novel and atmospheric (QRN?) of Africa.



The Operating Room and Transmitter at MX2B

W4MR worked F2PX on St. Pierre Island . . .off Newfoundland. He was T7 and on 14,350 kc W1AVB worked him too and got his QRA. Paul Detcheverry, B. P. 61, St. Pierre Island. Another good one for W4MR was ST2BN, 14,351 kc. The time of the QSO was 0445 G. m. t.

Received a nice letter from BERS-195, Eric Trebilcock, the premier dx receiving king. He has moved

[*Continued on Page 67*]

A De Luxe Portable Transmitter

By Paul D. Langrick,* W6PT

Vacations and portable transmitters are practically synonymous, for a jaunt is much more enjoyable with some sort of rig to work the boys at home.

However, there is always the question of what sort of transmitter to take on the trip. Will it be a "station with a handle on it" and weigh so much that it takes two or three persons to carry it, because it must have several hundred watts in order to be able to work w.a.c. every evening? Or, will it be so light and so small that it takes only a little room in the car, but, as a consequence, is of limited power? Will its "innards" then be such that if one thing goes haywire, the whole rig has to be torn down in order to do any diagnosing? In addition to deciding what sort of transmitter you want, there is, too, the item of selecting the band or bands upon which the rig will work.

Briefly, here are the problems and the author's answers to building the portable transmitter that will make the summer complete:

1. The transmitter must have sufficient power to deliver a good signal at distances up to several hundred miles and be capable of delivering a signal with a note that is nothing less than T8. The answer is an output of not less than 40 to 50 watts, crystal controlled, with a fairly decent power supply.

2. The transmitter should be limited in weight to the point where it can be carried with one hand. The "de luxe" portable herein described weighs 55 pounds.

3. It should be of such construction that it would be possible to use the portable as an exciter unit to drive a much larger transmitter for home use when necessary. The author had in mind an additional unit of the same size and shape, to house a final composed of a pair of HF-100's to be driven to 500 watts input, as this is the legal limit in the country in which the transmitter was originally designed to operate.

4. It should be presentable enough that one could carry it into a hotel room or lodge without apologizing for it. This question of appearance is a matter of personal taste and is left up to the individual. Note that the black wrinkle of the cabinet, as well as the grey wrinkle (both of fine texture), and the black knobs, dial, and meter case do lend themselves to being "swank."

5. Its construction should be such that the output is not limited to any one particular band. This unit employs two crystals and crystal switching. It is capable of being operated in both the 80 and 40 meter bands, or any two pre-determined frequencies can be used in either band. This is a boon to the traffic man who may want to maintain his "spot frequency" net schedule, even while vacationing, and have an additional frequency for rag chewing. Or, again, a member of the army or navy net may want to maintain his particular schedule or drills on frequencies outside the ham bands and do some rag chewing too.

6. It should be free from self-oscillation and harmonic radiation. A push-pull oscillator circuit was chosen for being the best under the circumstances in delivering the most output per unit weight and being more or less free from second harmonic radiation. The very nature of the circuit makes it mandatory that inductive coupling of some sort be used.

7. The construction should be such that almost any kind of an antenna could be used. In the de luxe portable, the universal antenna coupler is link coupled to the plate tank.

8. There must be some means of adjusting

* 626 Maltman Avenue, Los Angeles.

the line voltage in order that there would be no danger of burning up the set with too high a line voltage. The adjustment of line voltage is left to an additional unit as this will not be used at all times. A good many places have 110 volts from 33 to 60 cycles available in the particular country in which this transmitter was designed to operate. The line adjusting unit is composed of an auto transformer capable of delivering 110 to 115 volts from any line voltage with 70 to 250 volts on 33 to 60 cycles. A meter to read these voltages is incorporated in the unit. An ordinary house-type fuse is used in the power supply of the transmitter. It is accessible from the back where it protrudes just enough to be grasped easily. This fuse comes in handy when one plugs the transmitter into a d.c. outlet, as the fuse will blow before the power supply can be harmed.

9. This proposed transmitter must be constructed sturdily enough to withstand rough usage. An all-steel cabinet will stand plenty of abuse. This cabinet is 24½ inches high, 14¼ inches wide, and 11¾ inches deep. The cabinet and one-eighth inch dural panels, less any transmitting parts, weigh only 20 pounds. That's less than a leather-covered, wood, or fiber case of the same size.

Incidentally, dural panels were selected because they have the same strength as steel, but weigh only one-third as much. They are more expensive, however.

Each part was chosen for its particular function, and each part is oversize or has a voltage rating far in excess of the voltages used in the transmitter.

It may seem foolish to many that the by-pass condensers have a 5000 volt rating, when only 550 volts are used. But, over-size parts are used in order to make the weakest link in the transmitter the tubes used (and American-made tubes are noted for the abuse they will take).

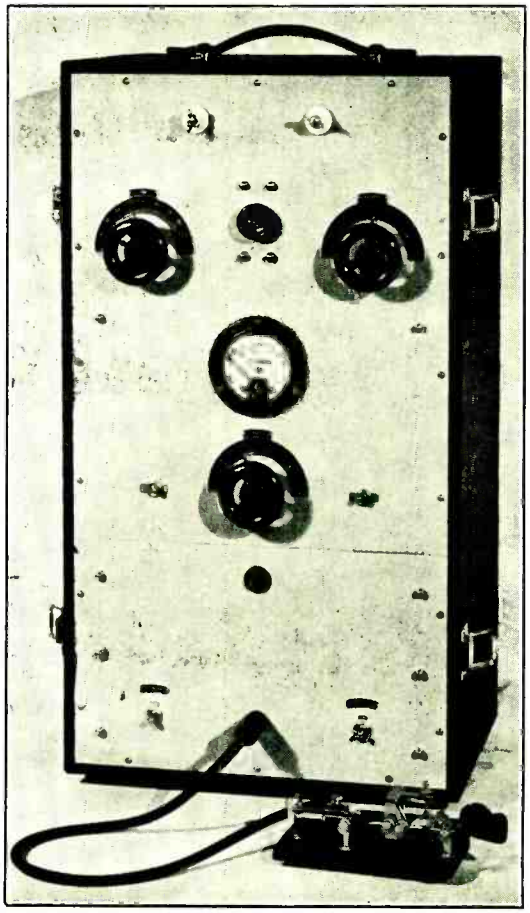
The R. F. Section

The transmitter and antenna coupler are built on a dural panel 13⅜ inches wide and 16 inches high. This was made in a single unit as it is the complete transmitter less the power supply and would make an excellent transmitter to be run from batteries in case of an emergency.

By substituting 6V6G tubes for the 6L6G's in this case, the filament drain would be less and the output would not be changed to any great extent.

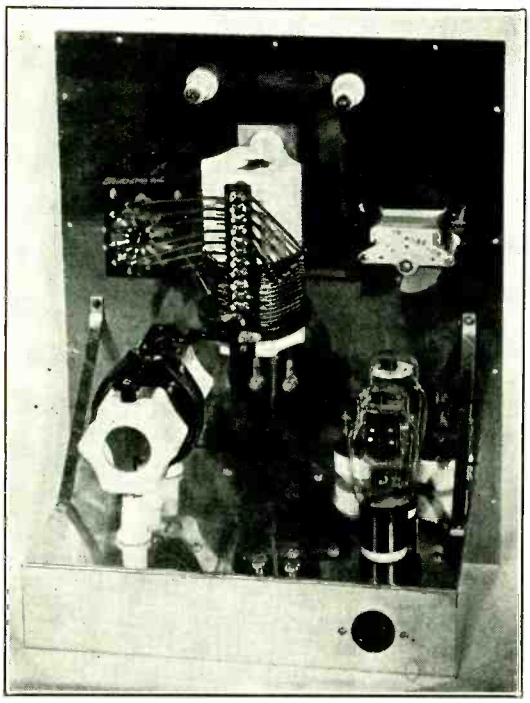
By looking at the underchassis view, it will be seen that the plate tuning condenser is mounted in the center of the chassis. This condenser is mounted on two pieces of bakelite 3¼ inches by 1¾ inches by ¼ inch. The above method of mounting was selected in order that the condenser would be insulated from the chassis and in order that a convenient and relatively strong support for the condenser would be provided. In addition, it provides a mounting support for the by-pass condensers so as to increase the normally weak methods of mounting this type condenser. The two high voltage by-pass condensers are mounted on a ¾ inch piece of bakelite and fastened to the end support bakelite plates upon which the tuning condenser is mounted.

The ¾-inch bakelite piece is held in place by a ½-inch screw and "hold-tite" washer at each end. The bakelite end plates are held



down by two of the same size screws passed through the chassis and into tapped holes at each corner of the plates. All of the tapped holes in the bakelite were made to be as tight as possible.

The cathode by-pass is fastened in the exact center of the cathode bus. This was done in an attempt to stop a parasitic oscillation to be described later.



Back view of the r.f. and antenna tuning unit removed from the cabinet

The plate and antenna coils are wound on small ceramic coil forms and are held in place by "feed-through" type insulators.

All wiring in the transmitter, except for the actual link coils, is of number 12 enameled wire. This wire is strong, self-supporting, and, if sufficient time is spent in soldering each wire in place, it should last a life time and give no trouble.

There was only one major difficulty encountered in the construction of this particular transmitter: the crystal switching method first used. A double-pole double-throw toggle switch was tried because the circuit was push-pull and the author believed it best to switch both sides of the crystal. Too, it seemed that the toggle type switch would be inexpensive and match the rest of the switches used. However, the set-up caused no end of trouble. The crystals would try to work, then go on a strike. Self-oscillation developed and parasitic oscillations showed up all over every band.

Well, the next thing was to try series crystals. When tuned to the 80-meter frequency, everything seemed all right. But—when we tried it on 40, the situation was entirely reversed. The output was so limited that this method was finally discarded.

Parallel crystals next came in for investigation. Not much better luck. After some deep thought, it was decided to try series crystals again with some method of shorting out the unwanted crystal. A single-pole double-throw, toggle switch was selected. It proved to be the answer to any ham's prayer for a convenient and extremely simple method of switching crystals or, at least, of choosing one crystal from any two plugged into their respective sockets.

The Power Supply

The power supply is built on a chassis the same size as the transmitter. It is 12 inches wide, 8 inches deep, and 2½ inches high. It is mounted on a dural front panel.

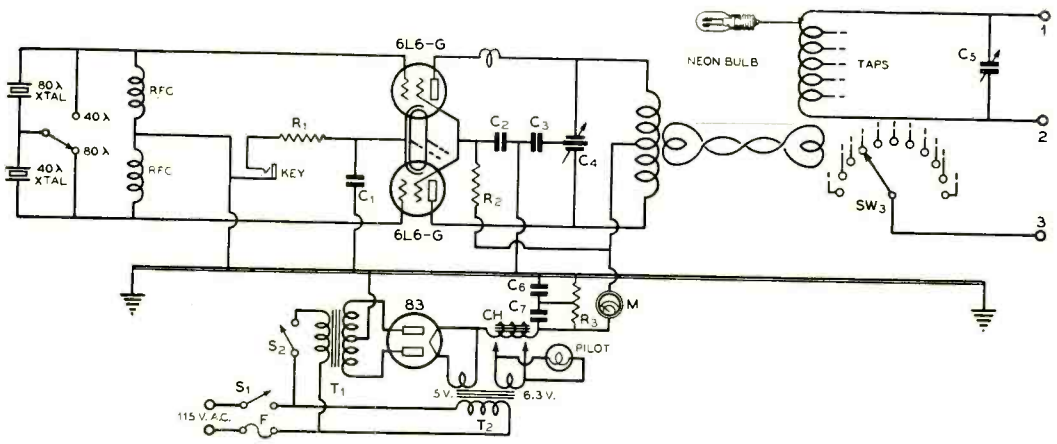
The power transformer and filament transformer are somewhat oversized, since they were designed with a core to permit 30-cycle operation.

The swinging choke is rated at 100 ma. more than used in this power supply. The filter condenser is composed of two 8 μfd. 500 volt condensers in series and the filtering action is such that this transmitter delivers a beautiful T9 note.

As will be noted in the diagrams of the power supply, the filament switch must be closed before any energy is fed into the plate power switch.

A 20,000 ohm bleeder is used across the high voltage in order that it will not develop too high a voltage with the key up. The voltage regulation of this particular unit is very good indeed.

Glancing at the front of the transmitter view, the switches and controls are as follows, reading from left to right and starting at the bottom: filament supply switch; jack for the key; plate voltage supply switch. Near the top of the power supply panel is a ¾ inch red bulb eye with a 6.3 volt bulb back of it connected across the filament voltage for the 6L6's.



General Wiring Diagram of the Complete Unit

C_1—.01 μfd. 600 volt paper
C_2—.002 μfd. mica
C_3—.005 μfd. mica
C_4—260 μμfd. per section, 1000 volts, split stator
C_5—150 μμfd. 1000 volt variable
C_6, C_7—8 μfd. 450 volt paper
R_1— 200 ohms, 20 watts
R_2—10,000 ohms, 20 watts
R_3—20,000 ohms, 55 watts, slider type
CH—250 ma. swinging choke
T_1—1400 volts c. t., 250 ma.
T_2—5 volts, 3 amps.; 6.3 volts, 2.5 amps,
RFC—2½ mh. 125 ma. r. f. chokes
M—0-500 ma. d. c.
Plate coil—18 turns, 2¾" dia., slightly spaced
Ant. coil—16 turns, 2¾" dia., tapped every other turn
S_1—Filament control switch
S_2—Plate voltage switch
S_3—Tap switch on antenna coil
NOTE: The parasitic choke in one plate lead consists of 6 turns of the hookup wire around a regulation lead pencil.

The controls on the transmitter are: first, crystal selector switch, with its "Hi-lo" name plate, which comes in rather handy as the crystals can be inserted in such a fashion that one can choose to suit himself whether the "hi" means in frequency or wavelength; second, the plate tuning control, dial, and name plate. The next switch is to short out the meter, if one grows tired of seeing it swing as the rig is keyed. The tip on the name plate was filed off and the plate turned around in order that it now reads directly. In other words, when the switch is thrown to "on", the meter reads and when thrown to the "off" position, the meter is shorted out of the circuit.

The meter is a 0 to 500 milliammeter and reads only the plate current. The next control wheel on the left is the antenna coil tuning condenser. Next comes the ¼-watt neon bulb with its bakelite protective guard. This bulb is connected on one side only to the antenna lead and is used as a visual means of telling when the antenna network is tuned to resonance and of watching the keying action for any lag due to a "slow" crystal or too heavy loading.

The next control wheel is connected to the antenna switch, which has 11 taps on it. This switch is used as will be described later.

Operation

This transmitter is very easy to tune and put in operation. After one becomes accustomed to its operation, it is a relatively simple matter to change frequency or bands and retune in a few moment's time.

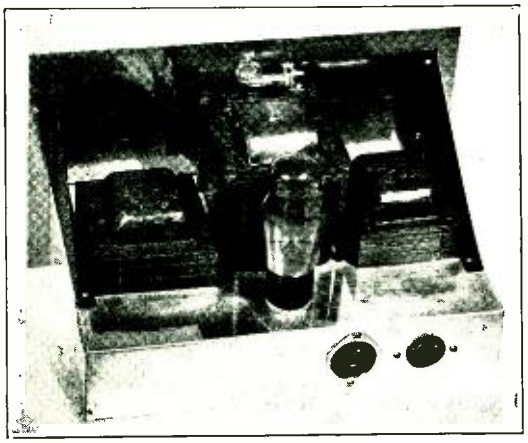
With a 60-watt light bulb connected across the antenna terminals, it can be lit to approximately its full brilliancy. It is not possible to key a light bulb load as the load impedance changes too rapidly.

In choosing crystals, one should select only the best for this type of operation, because a good many crystals are somewhat sluggish and do not permit one to key them. In a straight oscillator, they may work in a satisfactory manner, but they are not desirable in a keyed power oscillator.

AT-cut crystals were chosen for this transmitter as it was found that it is impossible to use an automatic key and still have some ordinary crystals "take off" on all dots. With these crystals in use, this particular transmitter develops a beautiful T9 note on both 40 and 80 meters and will stand quite heavy loading.

It is important that the plate tank condenser be of the size specified and that the plate coil be space wound. Otherwise it may be impossible to hit both 40 and 80 meters just by re-

tuning the condenser. If the coil has the correct inductance and the tank condenser is of the size specified, the condenser will hit 40 meters with the plates nearly unmeshed and 80 with the plates nearly all the way in.



The Heavy Duty Universal Power Supply (33 cycles up)

The antenna coupler may be used to feed a single wire fed antenna, a Marconi, and end fed antenna, or a doublet with either tuned or untuned feeders. It may also be used to tune a zepp with parallel tuned feeders. The combinations made possible by jumpering either 3 and 1, 3 and 2, grounding 2 and connecting feeder or antenna to 3, etc., allow lots of leeway in regards to antenna requirements.

If desired the size of the cabinet could be reduced somewhat by crowding the components. However, this would not reduce the weight to speak of, and would not allow such permanent or rugged construction.

If the unit is expected to work only on current of 50 cycles or more, slightly smaller transformers could be used, thereby reducing the weight by a few pounds. This particular unit was designed for use either as a portable in this or foreign countries; as an emergency transmitter to operate from batteries, dynamotors, vibrator, or other such supply; and as an "expedition" transmitter to be used either on a boat or afield. Filaments and other such wiring are brought to a terminal strip to facilitate changeover to battery or other type operation. Room was left in the cabinet for a 200 watt autotransformer (33 cycles) so that the rig could be operated on any voltage from 70 to 250 volts a.c., any cycles. It is mounted in the cabinet only when the need for it might arise, as it adds several pounds to the weight and it is not always required.

With a power supply voltage up to 450 volts on the plates of the tubes, it is possible to use 10,000 ohms in the screen dropping resistor. But on plate voltages above that amount and up to 550 volts, the screen dropping resistor should be increased to 15,000 ohms.

The plate voltage at the plates of the tubes on this transmitter, with key down, is 550 volts and the tubes are usually loaded to 150 to 200 ma. A convenient method of carrying the key, a.c. cord, antenna and insulators is to secure one of the little zipper-type bathing suit bags sold in any department or drug store (in Los Angeles at least!).

If one can secure a length of the type of antenna wire that is used on airplanes, it is possible to wind this up into a small roll. This type wire is very flexible and is made to go on reels in the airplane. One could even put it on a good-sized fishing reel.

A hint or two on determining the voltage, at least if not the type of current, is to look at the light bulbs when first moving into a hotel room, cabin, or lodge. Usually, the operating voltage is stamped on the bulb.

◆

CALLS HEARD

Donald W. Morgan, 15 Grange Road, Kenton, Middlesex, Eng.

(April 1 to May 1.)

(14 Mc.)

W 1AGX; 1AKT; 1AOL; 1APS; 1BGC; 1BGY; 1BUB; 1DFN; 1EQU; 1FOV; 1GFT; 1GPU; 1GR; 1HFN; 1HHW; 1HIU; 1HQ; 1IAQ; 1IMD; 1IQV; 1JOH; 1KAK; 1KBN; 2ABD; 2AGI; 2AWX; 2BER; 2BHW; 2BJ; 2BM; 2BMB; 2BYK; 2CTC; 2DNL; 2EJO; 2FKE; 2FPX; 2GOX; 2GTP; 2HSQ; 2HTU; 2HW; 2IGY; 2IIQ; 2JOF; 2JIP; 2JGL; 2JRP; 2JUU; 2KDW; 2KHE; 2ME; 2VAO; 3AWJ; 3CDG; 3CIC; 3CLI; 3CNP; 3FAH; 3FNY; 3FRY; 4DAJ; 4DCQ; 4DNG; 4DSY; 8AUW; 8AYD; 8DDH; 8GFF; 8ISY; 8KKG; 8LKH; 8MCY; 8MKU; 8MZE; 8NTA; 8NTR; 8OFX; 8PAJ; 8PRF; 9DR; 9RHP; — CN8AR; CN8MA; CN8XC; CT1KN.

D 3AZV; 3CHM; 3DSH; 3DAS; 3DLC; 4BQF; 4PHM; 4QUM; 4SNP; 4TDB; 4TLP; 4XOF; 4YUM; 4ZZS; — EI8HM; ES5D; F8II; F8GV; F8QA; F8RC; F8VK; FM8BG; FM8OX; FM8DA.

G 2BY; 2DL; 2GK; 2JU; 2LA; 2UV; 2UX; 5AN; 5CV; 5LA; 5SR; 5YC; 6GR; 6LJ; 6QO; 6VP; 6XP; 6YP; 6ZA; 8IL; 8KW; GM6XR; HA-1D; 1G; 1K; 1P; 2D; 2K; 3J; 4H; 5C; 5P; 7B; 8A; 8C; HB9AT; HB9BQ; HB9J; HB9X; I1GA; I1IV; I1KN; I1RCN; I1TKM; I2PF; K4UG; LA-1H; 1Y; 2Q; 3A; 3C; 4A; 4P; 4K; 5L; 5Q; 5R; 6O; 6Q; 6X; 6Y; 7K; LU3EV; LU4BH; LU4HB; LU5AN; LU6JH; LU7FA; LX1CC; LY1KK; LY1KN; OE1EK; OE6QN. — OH- 1NL; 1NM; 1NY; 2NX; 2OB; 2OG; 3NP; 5OA; 5OD; 5OJ; 6NS; 6NV; 8NE. — OK- 1CX; 1DJ; 1KX; 1NS; 1OD; 1OM; 1RX; 2BX; 2FO; 2KP; 2MA; 2MM; 2OP; 2PN; 2RR; 3XF. OZ1L; OZ1NW; OZ5BK; OZ5C; OZ5K; OZ5P; OZ5UU; OZ5Z; OZ8SS. — PY- 1BX; 1MX; 2AJ; 2AU; 2DN; 2EA; 2GS; 2HM; 3BJ; 8AH. — SM- 2TF; 5QO; 5TI; 5UC; 5UD; 5UP; 5UV; 5VJ; 5WK; 5WZ; 6QP; 6UA; 7QR. SP1AI; SP1AR; SP1FH; SP1FP; SP1HH; SP1LM; SP1LMF; SP1LN; SP1LP; SP1LU; SP1MD; SP1PM; SU1RH; SV1KE; U2AE; U3CY; U3FB; U9AF; UE1BK; UK1CC; UK3CC; VE1GK; VE3AH; VE3JP; VE3JQ; VE3QH; YM4AD; YM4AS; YR5AA; YR5CF; YR5OR; YR5RY; R5TP; ZB1H; ZB1J; ZB1L; ZB1P.

Dx Department

[*Continued from Page 61*]

from VK5 to VK8 at Darwin, which is in the northern part of Australia. Eric is going to see just what kind of a location the VK8 district really is and we will have something to report on it a little later. If he finds it to be the choicest yet, then any of you that want can pack up and move there. He has logged 138 countries, and says it troubles him when he reads that the gang have been working such stations as HR7, VP3, TF, HD, YA, PJ, VR6M and Nottingham Island, etc. As yet he hasn't been able to hear them. Wants to know more on ST2LR and if he is ex-G2LR and if so the QRA. BERS-195 has been hearing OQ5AA ex-ON5CGW on fone quite a bit and coming through very good. Well, here's wishing Eric good luck at his new QRA. He will not be troubled with local QRM as there are no active hams there and the nearest BC station is 2000 miles away. Incidentally, his letter was mailed on May 18th in VK8, and sent air mail via Singapore and London, arriving here June 7th.

W9FM visited XE1BT and enjoyed the call very much. XE1BT has worked 38 zones on c.w. and 22 on fone. W8BKP now has 38 zones, the last one being U9AW. He says he has worked 132 countries and has cards from 127 of them. W9SLO has not been after dx very long but is getting some nice ones to start with . . . G6GH, GM6IZ, HH3L, J2NS, HA2D, ON4VU, ON4SP, SP1HH, PY1EA, PY1AZ, TF5C, VO8ARE, FB8AB, VK6SA.

Reg Tibbetts, W6ITH, now has 29 zones and 45 countries, while on c.w. he has 31 zones and 60 countries. In the fone contest he scored 23,400 points and worked Alaska and Hawaii on 160 meters. Reg has a flock of all kinds of certificates on his walls and is holding a spot for his WAZ certif. 6ITH has a sort of a hand picked QRA. He is located high on a hill in Berkeley, and is fortunate to be able to run beam antennas all over the landscape. Almost forgot . . . Reg received a baby girl on May 30th and he says she already recognizes a mike! (What! . . . no key?)

Ran across Don Wallace, W6AM, the other day and after prying around I found that he now has 31 zones on fone and 38 on c.w. Don also said that on each of three different nights during the phone test he made a w. a. c., and in the c. w. test he made five w.a.c.'s, each on a different night.

W6OCH, who is doing some mighty fine 20 meter fone dx in Oakland, hooked VU2DP, VE5TV the other day. He says that VE5TV is anxious for W6 QSO's and is on 14,112 k.c. around 6 to 7 a.m., p.s.t. VU2DP is on 14,005 kc. Larry has worked both of these stations three-way with W6TT. From W6JWL we learn that he has his 28th zone and is doing some work on c.w., such as CR7MB, VU2AU, FA8BG, FA8IH. W8LDR raised TF5C for his 33d zone.

Heard VK3EO in a QSO with W6KWA asking him what the 48th state in U.S.A. was. He said he had 49 cards there to send in for w.a.s. and couldn't find any duplications. Hooked him the next p.m. and found out that he had it all figured out, but said there were too many states, Hi. W7AMX has a few new ones looked . . . VS7RF, VS2AE, and FY8A, and now has 100 countries.

G2PL must be getting the "love bug" as according to his letter he is being bothered by four yl's . . . get that . . . *four*. Has his rig on fone most of the time and he says they really go for it. Two of 'em are Daphne and Yolanda, but he won't divulge the others as the other single hams are liable to cut in on him.

F8EO says that during April, 28 Mc. conditions were not very good. During the contest F8EO was running 200 watts on his T55 with his full wave zepp on 14 Mc.

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A very good slant on locations is given in a letter from W2IOP, in the heart of New York City. He brings up a very fine point that probably a good many fellows never think about, that is, the fellows who have a QRA out in the open with plenty of beam antennae. W2IOP lives within what he says, "one subway station from Times square", and where two busy Avenues start, West End and Riverside Drive. His shack is on the third floor of a 20 story apartment house wired with d.c. There are four d.c. elevators surrounding the shack, and yet he can lift his head high when he says he hasn't the worst location in the city. Larry has worked 33 zones, is w.a.c., w.b.e., w.a.s. So that rather shows something goes on there. I believe he uses a Q antenna. There are plenty of others in the same boat and a few that I recall that live in the heart of the city, are W2JXH, W2HHF, and W2GVX. When those guys make a w.a.c. they really do something.

W2JAD is another man who worked ST2BN, T9X on about 14,345 k.c. He says his QRA is in Khartoum, Sudan, Africa. Time of QSO was 10:57 p.m. e.s.t.

VE3ER doesn't like all the Central and South American phone between 14,000 and 14,100 kc. VE3ER claims honors to being the first VE to have a 10 meter fone QSO with an HK, also the first VE3 to work SM, YL, and PA on 10 meter cw. Jack wants to know if anyone has a card from VP7NI; if so, write him direct. The rig at VE3ER uses a pair of 830's in the final with 200 watts input on both fone and cw.

I notice in the phone division of the WAZ list that W6FTU, Doc. Haughawout (commonly known as "Doc. Halfwatt") has worked more zones than he has countries . . . 23 zones and 22 countries. Hi. However, Doc has just recently been bitten by the dx germ; watch those countries go up now.

Speaking of dentists, reminds me that by the time you read this our pride of Ventura, W6GRL, Doc. Stuart, will be on his way east to a dentist's convention . . . in Atlantic City, I think . . . which is scheduled the first part of July. Doc. Ironmonger, W6MLG, is also driving east, so don't be surprised if you hear a knock on the door of your shack about 3 a.m. and there will be W6GRL or W6MLG.

W6SJ, Geo. Davis, reports that he has been hearing EA9AH in Spanish Morocco, quite consistently on 20 meter phone. His frequency is between TDC and 14,000 kc. so I suppose a good guess would be 13,996 kc. George also says that W1FH worked TA1CC in Turkey, but W1FH didn't pass along the frequency.

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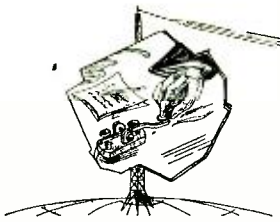
Registered Beef

A few of the boys have squawked about the publicity gained by the dx high point men in the recent contest mentioned in RADIO who were later disqualified for operating out of the band. The

[*Continued on Page 73*]



CALLS HEARD AND DX DEPARTMENTS

K. Nose, K6CGK, 3903 Old Pali Road, Honolulu, Hawaii.
(April 1 to April 16, inc.)

(14 Mc. c.w.)

D3GKR. D4FND; F3AD; F3AN; F3KH; F8EO; F8FK; F8IZ; F8PZ;F8TK; F8ZZ; G2CL; G2FH; G2IL; G2IM; G2PL; G2WP; G2YK; G2YH; G5NF; G5NG; G5QA; G5QY; G5VP; G5WP; G6CJ; G6CL; G6GH; G6IL; G6MK; G6RB; G6VP; G8IL; G8LT; GM6XI; I1TKM; 1ALH; OE3AH; ON4FE; ON4FQ; ON4FX; ON4MD; ON4SS; ON4VU; OZ2B; OZ7G; PA0QL; PA0QQ; PA0QZ; PA0VI; SM7YC; YL2CG.

Dr. Tng. Mario Lantangeli, I1ER, Volterra N. 3, Milano, Italy.
(Nov. and Dec. [Sat. and Sun. only] 1936)

(28 Mc.)

W- 1AK; 1ALB; 1AXA; 1CPD; 1CRD; 1CSR; 1DDQ; 1DZE; 1HDQ; 1HIL; 1IOB; 1MJX; 1KH; 1TW; 2AOG; 2BCR; 2CTO; 2DTB; 2WK; 2ZA; 3AIR; 3BWB; 3COD; 3EBP; 3F1H; 3FS; 3GHS; 3JM, 3ZX; 4EC; 4FT; 5BDB; 8AN0; 8BTI; 8BTK; 8CKJ; 8CRA; 8CUX; 8DSU; 8EBS; 8FAP; 8IMG; 8IWG; 8IXM; 8JAK; 8MWL; 8SR; 9ADN; 9LQU; 9UYN; VE1DZ; VE2CA;VE3TY.

(Feb. 6-21, 1937)

(28 Mc.)

W- 1ADM; 1BJE; 1DZE; 1EIO; 1ERS; 1IOD; 1IPV; 2AOG; 2BEF; 2BQK; 2DNN; 2EMV; 2GFH; 2HGU; 2HVQ; 2IIQ; 2JME; 2JMF; 2JOA; 2JXZ; 2MB; 2TP; 3EDQ; 3EEO; 3EPR; 3FIU; 3FQP; 3GEB; 3JM; 3PC; 5EHM; 6HB; 8ANB; 8AN0; 8CJM; 8DYE; 8HRD; 8HYC; 8IFD; 8IMP; 8JE; 8JFC; 8LDA; 8MWY; 9RS. VE2CA. Europe: LA-OH-SM-YL-.

Bob Everard, "Oakdene" Lower Sheering Road, Sawbridgeworth, Herts, Eng.
(April 18 to May 18)

(7 Mc. Phone)

CO2XX; EA9AH; TI1AS; TI2AV; TI2RC; YV5AH.

(14 Mc. Phone)

W- 5AHK; 5AKZ; 5APW; 5AXU; 5BEK; 5BID; 5BMM; 5CCB; 5CO; 5CTC; 5DNV; 5DQ; 5DVK; 5DVM; 5EEY; 5EHM; 5FFM; 5GIB; 5JC; 5ZA; 6AH; 6ACJ; 6AL; 6AM; 6AMG; 6BAY; 6BGH; 6BKY; 6BPM; 6CLS; 6CQG; 6CQI; 6CQK; 6CQQ; 6CZ; 6DEP; 6DTC; 6DWE; 6EJC; 6GET; 6IDY; 6IQA; 6IRX; 6ISH; 6ITH; 6IXJ; 6JPW; 6KE; 6KM; 6LD; 6LEN; 6LKS; 6LLQ; 6MWD; 6MWO; 6MKX; 6NMI; 7NNR; 60CH; 6SJ; 7AD; 7AMQ; 7APD; 7AXS; 7BAH; 7BWI; 7DNB; 7EXF; 7FQK; 7IF; 7MD; 7QC; 9DRQ; 9SPS. CE1AH; CN8AA; CN8AD; CN8AG; CN8AM; CN8KN; CN8MB; CO2HY; CO7CX; CO8AN; CO8EC; CO8OG; CO8YB; CX1AA; CX2AX; FA3LX; FA3LY; FA8AB; FA8CC; FA8LC; FA9AY. — FT- 4AA; 4AD; 4AE; 4AG; 4AH; 4AI; 4AL; 4AM; 4AN; 4AR; HH2B; HK1ABM; HK3JA; K4ENY; K6BAZ; K6CMC; K6JLV; K6MVV; K6NLV; K60QE; KA1AN; KA1MD; LU1EX; LU1HI; LU4AW; LU5CZ; LU6E; LU8AB; LU9BV; NY2AE; 0A4AG; 0A4AK; 0A4I; 0A40D; 0A4R; PK1MX; PK1VM; PK1ZZ; PK4AU; PK4DG; PY1FR; SU1KG; SU1WM; SU5NK; SU8MA; TI2AV; TI2KC; U3BC; U3BX; U3VC. — VE- 3AEX; 3DA; 3GS; 3HX; 3OC; 3GZ; 3SM; 4AAY; 4AW; 4BD; 4EA; 4JJ; 4KF; 4TM; 5BF; 5DK; 5ES; 5HU; 5JB; 5OT. — VK- 2ABG; 2ADV; 2AP; 2AZ; 2BZ; 2CI; 2CP; 2HF; 2HX; 2NO; 20B; 20Q; 2QH; 2TI; 2VN; 2VV; 2YW; 2ZZ; 3AL; 3EG; 3ES; 3IO; 3KX; 3MR; 3RW; 3XD; 4GJ; 4JU; 4JX; 4LW; 5AI; 5AW; 7CL; 7GB; 7YL. VO1I; VO1J; VO1P; VO1Y; VO2Z; VS7JW; VS7MP; VU2CQ; XE1G; XE2AH; XE2FC; XE2N; XE3AS; XE3W.

W. S. Ware, Jr., 4441 N. E. Davis St., Portland, Ore.
(March 15 to April 30)

(14 Mc.)

CE1AO; CE1BC; CE4DU; CN7AS; CN8CO; CO2HY; CO2JJ; CO2KC; CO2LL; CO2QQ; CO2SU; CO6OM; CO8EC; CP1AA; EI1A; EI2J; F3CP; F3JD; F3LW; F3SN; F8KW; F8NG; F8RV. — G- 2NH; 2XG; 3XV; 5FA; 5JA; 5ML; 5RV; 6LK; 6XN; 6XR; HH5PA; HI1C; HI5X; HK1ABM; K6CMC; K6JLU; K6KKP; K6KMB; K60QE; KA1BH; KA1DL; KA1JR; KA9AH; LU1DA; LU4CZ; LU5CZ; LU6KE; LU9BD; OA4AC; OA4AK; OA4C; OA4N; OH5NK; ON4CSL; ON5KD; ON4SS; ON4TK; ON4ZA; ON4ZD; PK1BM; PK3GD; PK3WI; SU1CH; SU1KG. — VK- 2ABD; 2AJ; 2BF; 2JU; 2LQ; 20Q; 2RQ; 2WF; 3AC; 3AL; 3LI; 3ZL; 3ZZ; 4ABG; 4JX; 4UD; 4UU; 5AI; 5AW; 5NL; 6MW; 6RL; 7NG; VP1AA; VP2DA; VP2DC; VP3BG; VP6YB; VP7NA; VP7NB; VQ2EAW; VS2AK; VS6AD; VS6AG; VU6FY; XU8HR; XU8HW; XU8MT; ZE1JN; ZE1JU; ZS2X; ZS6AJ; ZT2G; ZU6J.

Eric Trebilcock, (BERS-195), Darwin, North Autsralia. (Logged at St. Peters, South Australia)
(April 22 to April 30)

(14 Mc. Phone)

W- 3MD; 5AHK; 5DUK; 6BKY; 8AN0; CO7CX; EI3J; KA1MD; PK1GL; PK1ZZ.

(14 Mc.)

W- 3ZD; 4EFS; 5AFX; 5AVW; 5EZY; 5FRD; 5GGR; 6AX; 6LYM; 7FYR; 8CRA; 8DFH; 9HJ; 9UIA. AC4YN; D3BIT; C3CFH; D3BPJ; D4BUF; D4DHC; D4M0L; D4SNP. — F- 3X; 3DN; 8FK; 8EO; 8IG; 8PR; 8QL; 8RR; 8PZ; 8RJ; 8WB; 8ZZ. FT4AG. — G- 2FZ; 2KV; 20A; 2PL; 2XN; 2YB; 2YL; 2ZP; 5BJ; 5HB; 5HZ; 5MS; 5MW; 5QA; 5RV; 6DL; 6DP; 6GN; 6KU; 6PY; 6VD; 8CT; 8DL; 8JV. GM2TM; GM5ZX; HB9J; I1TKM; J5CC; J8CF; K4UG; K5AG; K6BUX; KA1DL; KA1MM; LA3I; LU8EN; OK1CX; OK2AC; ON4BL; ON4FE; ON4FL; ON4HF; ON4SS; ON4SU; ON4VU; PA0AD; PA0AZ; PA0DS; PA0QZ; PK3AA; SP1AU; U3BX; U9AW; U9MF; UE3EJ; UK3AA; VE9AJ; VP5AD; VS1AI; VS7GJ; VS7JW; VS7MB; VS7RF; VU2DY; XU6A; XU8IG; XU8HW; YM4AA; YR5AA.

Homer Hix, W8PQQ, 1588 Jackson St., Charleston, W. Va.
(March 6 to May 14)

(7 Mc.)

HK5JD; YS1FM.

(14 Mc.)

CE3AR; CM7AU; CM7FR; CM8AW; D3BIT; D3DSR; D4CDM; D4GAD; D4KSD; D4LAJ; D4QED; D4XCG; EI4J; EI8B; DS5D; F3DE; F3KH; F8EO; F8JI; F8NJ; F8RR; F8SN; F8TQ; F8WQ; F8ZF; FA8JO; FM8D. — G- 2AG; 2GQ; 2HQ; 2LB; 2MI; 2PN; 2QB; 2YK; 5DS; 5UU; 6CJ; 6JD; 6LK; 6PJ; 6RF; 6TD; 6UD; 6XL; 6XN; 8IL. GI2UAT; GI6TK; GM5YG; HA5C; HA8D; HB9BY; I1IR; I1TKM; K4DRN; K5AA; K5AF; K5AY; K6ILT; K7FST; LU9BV; LY1J; LZ2BK; OE1ER; OE3AH; OE7AJ; OH2NB; OK2BX; OK2LO; OK2MW; OK2OP; OK3UU; ON4XX; OZ2DA; OZ4H; OZ8JB; PA0AZ; PA0LF; PA0MQ; PA0TAK; PA0QQ; PA0YN; PY8AH; SU1SG; SU4RO; SM5ZF; SM6SS; SM7UC; U1AP; U1BL; U2NE. — VK- 2AEF; 2FT; 2HP; 2IW; 2JV; 2UU; 2YL; 3IW; 3JK; 3JT; 3UH; 3VU; 4GK; 5RL; 7CL. VP1RB; VP2AT; VP3BG; XE1CM; XE1PG; YM4AA; YR5CF; YU5AN; ZC2AQ; ZK1RG; ZL1DM; ZL1FC; ZL1WB; ZL2AL; ZL2II; ZL2OS; ZL2QA; ZL3FX; ZL3GR; XL4AV; ZS1AL; ZT5Z.

(28 Mc.)

D4YLI; G6YR; XE2N.

Marion H. Leverson, K6NRF, Schofield Barracks, T. H.
(March 1 to April 15)

(14 Mc. Phone)

CE1AO; CE3DW; J3EN; K7FST; KA1AN; KA1MD; LU5CZ; LU7ET; XE1G; XE2AH.

(14 Mc.)

AC4YN; CR7MB; CR9AA; F8EO; F8PZ; FB8AB; FB8AD; FB8AE; G8II; HA6G; HB9K; HC1JW; HI8X; HK1JB; HS1PJ; KA1MD; KA1MM; MX2B; CH1DL; PK1MO; PK1RL; PK3LC; PY2DN; SM7QD; U3BC; 79AL; VP2BC; VQ4CRO; VQ4CRI; VQ4KSL; VQ8AB; VS1AI; VS6AG; VS7GJ; VS7MB; VS7RA; V72CQ; VU2DP; XU6AW; XU8IS; ZE1JG; ZE1JN; ZE1JV; ZE1JZ; ZS1AL; ZS1AV; ZS2X; ZS5U; ZS7AD;ZS6AH; ZS6AV; ZT2B; ZT6AH; ZT6AW; ZT6D; ZT6S; ZU1V; ZU6AD.

Are You a Worm Warmer?

By Norman R. McLaughlin, W6GEG

How often have you been QSO some high-powered station, enjoying it 100%, when someone kicks on a low powered rig and covers you like a tent? Or how often has this happened to your signals at the other end? This often happens on very band. Sometimes it may be due to skip or some quirk of the ionosphere. But if it happens consistently then you are probably a "Worm Warmer".

Worm warming has been going on for years and some how no one seems to be particularly concerned about it. The ironical part of it all is that no matter what powered rig you may have on the air it can and will take place. The higher the power, the more effective the job. With a "California Kilowatt" it might even amount to "worm extermination". Worm warming is something that takes place outside the shack and is no respecter of what kind of gear may be inside the shack.

Broadcasters warmed worms for years. But back in 1933 the old Radio Commission made measurements of many of these broadcasters and the results were startling. Of its findings the present Federal Communications Commission says, ". . . that the efficiency of radiation systems varies from 5 to 60 per cent, the location of the transmitter being in a large measure responsible for this variation."

Largely as a result of this survey, F.C.C. Rule 131 came into being. To comply with Rule 131 and see that Santa Barbara's new 500 watter, KTMS, wasn't set up in some r.f. guzzling location, exhaustive tests were made in this vicinity. It was while making these tests that this business of worm warming became so evident. But, before getting into that, read carefully these following two sentences taken from the Sixth Annual Report of the Federal Radio Commission:

"If data were available on primary coverage of all broadcast stations and tabulated according to power, it would undoubtedly reveal that power alone is of minor importance in determining coverage and that there are other factors which are more influential. As a matter of fact, the percentage of modulation is more important than power and the effectiveness of the site and the efficiency of the radiating system are more important than either."

Most of us are too permanently located to be able to get up and move upon finding our location is not an effective transmitter site. But many sites now in use can be improved considerably as will be outlined later. Before getting to details, consider the following and then decide whether or not your site could stand a little improving.

In testing for broadcast transmitter sites, pursuant to Rule 131, a portable transmitter is set up on each of the sites under consideration. Tests are made between 12:01 a.m. and 6:00 a.m. local time on the stations assigned frequency. An antenna is set up and its resistance measured so that the power output may be readily checked by watching the antenna meter, thereby simplifying keeping the power output constant. The rig is put on the air and field intensity measurements made. These are made on not less than eight radials. Starting at the transmitter measurements are made on each radial at quarter mile intervals up to two miles and at half mile intervals from there out to six miles. To say that this is a tough job is to put it mildly. It is, however, through such thorough testing of transmitter sites that broadcast stations of today are able to provide the swell coverage they do.

The yardstick for antenna and site efficiency is the signal at one mile. Knowing this, through the use of Rolph's Graphs and Sommerfeld's Formula the coverage of any station can be calculated with a fair degree of accuracy. Since this method involves great gobs of math, a simpler but less accurate method is more appealing. Without attenuation, a station's signal at any distance is equal to the signal at one mile divided by that distance. For example, a signal of 100 millivolts per meter at one mile would equal 1 mv/m at 100 miles without attenuation. If, however, the signal at 100 miles is 0.5 mv/m instead of 1 mv/m then you know that the attenuation is consuming 50% of the signal. Calculations by this method will give a fair idea of a station's coverage but it is a poor substitute for the accepted method. Since amateurs are only interested in attenuation rather than signal strength

in actual millivolts per meter, this system is adequate.

With our particular test setup we had 5 mv/m at one mile. Compared to modern F.C.C. requirements this is practically no signal at all for a 50 watt broadcast station. Our test lash-up was comparable to the average ham radiating system. In fact, in many respects its efficiency was undoubtedly higher than most amateur installations. Nevertheless, our signal at one mile was about one fifth the F.C.C. requirement under Rule 131. (F.C.C. requirement, 50 watt station, about 25 mv/m at one mile).

Now, to put out five times the signal with our lash-up we would have had to increase our power by twenty-five, or to 1,250 watts! With this increase, however, we would still have a signal only as strong as a 50 watter installed to meet F.C.C. requirements. And, what's more, only 150 of those 1250 watts would be doing us any good! Such an installation might be swell for angle worms during the cold winter months! It certainly keeps the ground at a comfortable temperature. But even the ASPA won't give you a medal for cutting down a worm's fuel bill. Worms aren't on its list.

F. C. C. Rule 131 requires that broadcast stations meet minimum antenna height and ground requirements. Minimum height requirements for local stations are about 50 feet less than a quarter wavelength, generally speaking. For other classifications they vary slightly. However, the minimum ground requirements are the same for all classes of broadcast stations. They call for not less than 70 quarter wave radials (where a vertical radiator is used). Tower manufacturers recommend at least 120 quarter wave ground radials whereas many smart broadcasters use 140 or more and extend them to a half wavelength. Beyond a half wave, it seems, there is little to be gained.

Probably by now many are thinking, "I'm not in the broadcasting business, what's this mean to me?" It may mean a lot, read on. Remember that our test installation was an average ham antenna lash-up. And remember, that if you are in a good location, by the addition of a radial ground system with no less than 70 quarter wave radials, and maybe pushing your skypiece up a little higher, you can get the equivalent of a 25 time power increase. Are you interested?

This may sound like a pipe dream, but it's not. According to a law of physics, energy can not be destroyed. Radio frequency power is quite definitely energy. If it isn't in the air once it leaves your antenna, it must be in the ground. Where else could it go?

Some one is undoubtedly about to say, "But you're forgetting high angle radiation. If most of my power is in a sky-wave high angle lobe, you won't be able to measure much of it at one mile." That's partly true, but one point is being overlooked and that's the same thing we've been discussing, the *ground*. The ground, needless to say, acts as a reflector. It is the signal bouncing off the ground that gives you your angle of radiation, so far as the conventional radiating system is concerned. If the reflector is efficient there will be little loss as the r.f. bounces off into space. If it is inefficient and highly resistant to radiation, you'll make the angle worms happy. Heating the ground is the only other thing your r.f. can possibly do!

There are few directional arrays which afford a power gain of twenty-five. If they do, they're unusually undirectional, take up a dozen acres of ground and break you up in business paying for wire and poles required. Here, by the simple application of fundamentals you can obtain the equivalent of an all-directional beam with a power gain of twenty-five. The cost of putting in a radial ground system, is by comparison, chicken feed. The amount of real estate required is likewise insignificant.

Back in the spark days, many of you undoubtedly recall, instead of putting in beam antennas, (unheard of then) we put in "Rounds Grounds" and whoops went our signal! No one ever stopped to figure out why, apparently. If he did, he probably would have discovered, as we have since, that there was no need for the rubber tubing insulation that covered the underground radials from the shack to the galvanized wash tubs, copper wash boilers, or whatever was buried in the ground at the end of each radial. Nevertheless, the Rounds Ground was a big improvement over the water pipe. The writer recalls the thrill he got when his system was installed. With a half kilowatt, rotary gap and all, he worked stations one hundred and fifty miles away on good nights like nobody's business!

But it seems that just about the time we were finding out that the ground played a mighty important part in radio transmission, somebody worked a thousand miles with a pesky little light bulb that made no roar when you stepped on the key. Those of us who didn't give up in

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disgust after being deprived of our "roarin' rotary gaps" were too busy fussin' with these new fangled gadgets to pay much attention to the ground. After all, about this time didn't we discover that Hertz antennas were the business for "Short Waves" and that "a ground was not necessary with a Hertz antenna"? That's what we've been dreaming for years and it's about time we woke up .

Broadcasters and hams have much in common, in that there is no place in either game for high angle radiation. Some will argue that it's great stuff for 160 and 75 meters, but they're the same people who complain about selective fade, screwy signal reports, losing contacts and QRM. If we must go to one extreme let's concentrate on getting our angle of radiation too low. We'd be better off. But don't worry about it ever getting too low these days. Broadcasters have been trying for years and they can't even get it low enough.

Doubtless there are many disbelievers in this writing. It does seem to be a bit too much to expect from mere fundamentals. But before you're too convinced that you are right why not make this check:

Using your present radiating system, measure your signal at two wavelengths distant. Any one of a number of simple intensity meters written about in current radio journals will do. After all you're mainly interested in the comparative increase, rather than the actual mv/m measurement. Then directly under your antenna start laying out plenty of quarter wave radials (or longer ones if space is available) oriented with the center of your antenna as the center of your ground system. Then, check your signal at the same spot again. If after doing this, you still think the writer is all wrong, drop him a line and he'll send by return mail, a neatly hand knitted bed jacket for your angle worm's comfort.

If you find that you can't honestly write for a bed jacket, then get yourself some more wire and keep laying 'em down. The more the merrier. If you can lay half wave radials instead of quarter wave, do that and check your signal again when you're through.

In installing the ground permanently, do not put radials deeper than 12 inches. The nearer the surface the better. Salvage wire will do nicely and its size need not be over no. 14. In fact any size wire will be better than none at all.

◆

The New Yorker introduces the megacycle as a vehicle. Discussing a television demonstration in Gotham, this mag says that the images which were sent over to the Empire State building by wire came back to RCA building on a *megacycle.*

Dx Department

[*Continued from Page 67*]

general trend of the complaints was that they were taking unfair advantage of the rest of the gang by working out of the band, and at the same time, not obeying the law. Well, there seems to be more than one way of taking unfair advantage of the majority—running more power than the maximum of 1000 watts as allowed by the law, for instance. One is just about as unsportsmanlike as the other; the only difference is that when operating out of the band one is more likely to get caught. Unfortunately some of the high point stations whose scores were not challenged are known to have run more input than the law allows, but such things are hard to prove. When you are caught out on a limb on 14,405 kc. and spotted by several operators, not much in the way of proving is necessary.

As you know, the next issue of RADIO will be the October number (out the middle of September). Therefore you fellows are going to have a lot to tell me before the summer is over. Don't hold off on any news; write it at once even though you have to write a couple of letters during the next six weeks. Let's get the greatest bunch of dx news we've ever had for October RADIO. There are two things I wish you would do: send in any changes in your zones and at the same time dig out that January issue of RADIO and find out how many countries you have worked and send in the total to me.

Remember, in order to have your country totals listed, you first must have 30 zones, and then the number of your countries will appear after the zones.

In the meantime, I hope you have a swell vacation . . . and we've had ours, thanks. Oh yes, QD has new antenna, getting ready for a season of W9 dx.

Adventure in Mexico

[*Continued from Page 40*]

saw a car so caved in that we wondered at its ability to navigate—and a mile farther on saw the car that hit it head on. At six o'clock that morning both Mexican cars had been in the center of the road and neither would move out to the edge for fear of dropping off. A mechanic asked us for a ride to Jacala, about twenty miles away. He said one man had been killed. He appreciated the conversation in Spanish, saying that most tourists know absolutely nothing of the language. A few miles above Jacala an Army man stood in the road with upraised arm and also asked to stand on the running board and ride to town. These people really should learn the thumb system, as not one of the seven we picked up could have been understood except by translating a long string of Spanish. One barefoot boy about ten years of age didn't seem to speak much Spanish but knew only that he wanted to go a long way in our direction. Twenty-eight miles farther on he pointed out his village.

Special Foreign Licenses

Monterrey looked much less quaint on our return. We were better acquainted with Sanborn's soda fountain by then and enjoyed some familiar dishes. We called on R. W. DeBergue, XE1CV, whose garage is used by the hotel, finding that he had returned from Mexico where he had argued his case for a license. Four hams had lost licenses even though born in the country because they had entered in the application the foreign citizenship of their parents. These stations will probably be back on the air soon. DeBergue had a nice 20 and 40 meter phone rig built on a rack. When we walked in, he had the Silver Marshall receiver on its side in an attempt to get it down to ten meters. Because of the attitude of the "Mexican" hams, he is going to use 14 Mc. and higher frequencies in the future. He had many good words to say for RADIO.

After dinner we saw XE2N again, finding him making up one of Smith's crystal oscillators as described in RADIO. He said that he wanted to give 56 Mc. dx a try, for the thrill of doing something different and harder. Also, he had put up 60 feet of an 80 foot mast, promising quite an improvement over the old antenna system.

The next morning we bid good-bye to Old Mexico, returning to the United States filled with a satisfaction that after all, our country is a very comfortable place in which to work and live.

"At Last . . . a QSO"

[*Continued from Page 47*]

you can't miss 'em; they even have a foreign accent to their signals.

You can distinguish them by countries, too. The Germans have signals that are deep-rooted, like a barking dachshund.

The Britishers have a sort of waver to their sigs . . . just like they wavered when the king wanted to quit.

Take those "F" signals . . . from the French hams . . . there's one of 'em now. Lissen to that boy roar in. Roar in is right—a bullish roar—frog-like. So *that's* why they call 'em "Frogs" over there? Yessir, that's a Frenchie alright. I'll call him.

I will not! That pal of mine around the corner with his 7 kw. gone up to 11 kw. tonight, with the fake scales on his meters to fool the R.I. . . . he's calling the French ham. What chance has a gentleman like me got on a night like this? Hope the Frenchman doesn't answer him. Maybe his sigs are so powerful from his 11 kw. that he'll skip right over France and land in the Dead Sea somewhere.

No cause for alarm . . . these Europeans stay in for another twenty minutes. I still have hope. Got to get up nerve now, and lots of it. I'll do the impossible. I'll call CQ. Who says there isn't a single European ham a-livin' who mightn't *possibly* be listening instead of sending? They can't all send at one time. Somebody has to listen, don't he? Else, how do they hear? I'll try it—just once.

CQ, CQ, CQ, DX, DX, DX, CQ, etc., over and again . . . not too many agains, but enough to get into Europe. It may be a steal. Who knows? Ham radio is strange, far stranger than those who are in it. Boy, a million bucks for a cigarette. Not even a stale butt in the fireplace. How can a fellow listen when he can't smoke? All right—ask the man who don't smoke, then. Have it your way.

CQ calling all through: Now to listen. Listen close, now, brother—listen, listen, listen—There's *something,* weak as a flea with the TB . . . he's a-comin' back at me, he is, God bless him! What a man. Who says the Europeans don't answer CQ's? Boy, wonder what he'll sign? A "G"—mebbe a "D", perhaps an "F", or maybe some romantic yl 'way over there in Spinole. Yep, sounds like a yl's fist. How can I tell? Never heard one just like it before, so it must be something swell! Romance. The suspense is awful. He, or she, or it keeps callin' and callin' and callin'—my call . . . that sacred thing the govt. knows me by. I've even forgotten my name. Gosh, why don't the thing sign . . . why don't it *sign???* I can't stand it much longer. Nobody less

than a million miles away would ever dare to call another ham so long as that. Got the end of my pencil chewed to shreds. Cheap lead they use in these pencils you pick up in Pullman cars. Hope it isn't indelible, but I can't stop to look now. Got to know who's callin' me.

There—THERE IT IS, the *sign!* Wait 'till I lay my hands on that *punk,* that *ham,* that *lid,* that crystal cracker, that . . . . oh, that dirty so and so! It's another W6 coming right back at me, callin' me nine hundred times, and every European in bed before he gets ready to sign that "six" call of his. Calm myself . . . like all good hams do, in such a catastrophe. Can't work a European now, so a "six" is the next best thing. Got to keep fully under control in this ham game.

So instead of working a European I work a W-six. Time is what he has the most of, so he likes to send letters, and words, and more words and words. He tells me that I'm coming in R2, and he's only a hundred miles away. Wonder if he has his headphones plugged-in? Or his ears plugged-up?

I learn that the "wx" down his way is cloudy HI, and that he has nil down there HI, and that's fine business, Old Man, HI, and sure glad to work you Old Man HI, and I'm using a single triode oscillator Old Man HI. The so-and-so is coming in on my receiver R-99 plus, and he only hears me R2 with all the power I got.

Great stuff, that QSO. I learned a lot. I learned what a clever guy he is to be comin' in here R-99 plus, with not enough power to kick a spirit in the pants, and here am I with my bottled kilowatt, with rosy cheeks on the plates, and sizzling corona sparks flying all around the room from surplus r.f.

I get rid of that lid in a hurry. I've had enough for one night.

I uncrank the juice . . . give the neighbors a chance to steady their nerves. Throw my pencil at the table. Miss the table. Hit the new tube smack in the belly. It sort of cracked a bit, it did! And it won't ever work so good again, it won't. Hope some day they make the things with iron hats, like the receivin' tubes.

What a night!

There's the door-bell. Must be the wife, back from the show, with that cheap chinaware the movie moguls hand out. Hope she don't bring one with strawberries painted on the sides of the dish. I'm having raspberries for breakfast in the morning.

Say, I thought you were my wife, when the doorbell rang; I see you're my neighbor. What you doing up at this hour of the night? Came to tell me some bad news, did you? Listen, brother, you can't make any more trouble for me tonight. What's that you say . . . your radio receiver went up in smoke a while ago and you found out that I hooked my transmit-

ter to your BCL receiving antenna instead of hooking it to my regular transmitting antenna? And you want me to buy you a new receiver, or you'll make a lot more trouble for me.

Angelo

Came the dawn!

That ham who was over night before last — yep, THAT'S HIM . . . he's the guy who is responsible for all this mess. That fellow Angel who chisels my cigarettes, burns holes in my radio table, borrows my tools and brings back an apology in place of the tools, drinks my coffee, eats my doughnuts, and then wants to know if I can drive him home because it's raining again tonight. Yep, *he's* the ham who is to blame for all this—*he's* the ham who scraped the neighbor's B.C.L. receiving antenna wire the other day, when he thought he was scraping my transmitting sky-wire . . . and I, like a sap, hook my rig to the neighbor's B.C.L. antenna!!!! Wait 'till I get my hands on that ham!

So the wife comes home from the show. And who should bust into the house with her but Angelo? He was on the way to see me before the Europeans and *that* W-six came in, but he met my wife on the corner and he took her to the show instead.

Angelo is a nice boy. He also won a piece of chinaware at the movie show. So the wife brought home two pieces of china, and Angelo to boot! Angelo is all smiles from ear to ear. The show was swell, says he, Old Man. And he got his first Japanese station on 20 meters last night, he said, Old Man. So I picked up the two pieces of chinaware and started after Angelo as he beats it down the stairs, sensing that Demon Jealousy had gotten the the best of me, at last. "You may have gotten your first Japanese on 20 last night, Angelo," says I, "but tonight you're a-gonna get two crashes from China" . . . and I let's him have 'em, right in that hollow spot where the headphones hang on his dome.

Angelo Later

◆

Working Dx

[*Continued from Page 50*]

during a contest with every ham in the U. S. A. ready to pounce on an Asian CQ, you can imagine my feelings. I had never heard PK3BX on 7 Mc. so didn't know just where to listen for him. I knew I could hear him if another local station could. The local calling him was

a good operator and would not start calling the PK blind just because he heard a W-6 calling him. It wasn't exactly in order to phone the local to ask PK3BX's frequency. It would be too late then anyhow.

Checking my log showed that when I heard PK3BX on the 14 Mc. band he was invariably on 14,300 kc., crystal controlled. That was enough for me. I gave him a slow but not too long call from the middle of the band and listened for him on half 14,300, or 7150 kc. Believe it or not, Mr. Ripley, he came back to me. I felt so kindly toward the local who had unwittingly put me on the PK's track that I told PK3BX to listen for him. Besides, that sometimes keeps the "other fellow" from getting sore in case he is a bad loser.

Yes, a little thought pays big dividends. For instance, if you call a station and there is no response, don't fly off and look for others. Tune around and see if you can find the station he is QSO and see what relation his frequency is to yours. By these simple observations and a few simpler deductions you will know what strategy to pursue the next time you call the station. There was a reason the other fellow raised him instead of you. Find out what it was.

Of course if you find them coming back to stations near your own frequency *too* often, it simply means that you are not getting out, and need of attention to the antenna is indicated.

Some, but very few, stations can be worked "across band" . . . that is, with you on one end and they on the other. If you are unable to raise a station after several orthodox trys and your ability to work other stations in that vicinity shows that at that time of day you are getting a signal into his location, try the unorthodox as a last resort. I have worked several XU stations this way, they around 14,320 kc. and I on 14,002 kc. But I never try this procedure except as a last resort, because 95 per cent of the dx stations will start tuning from their own edge, and never get to the other end without first running across someone else calling them.

A lot of choice dx, the elusive kind, will be heard calling other dx stations who are usually up in the band from one edge, and often in the middle. In this case it is a good idea to QSY up into the band as near as possible to the stations they are working and give one a call when he has just finished a QSO.

There is even a time for "CQ DX", though certainly not during a dx contest! Suppose some morning you as an east coaster get a good report from an Asian who is coming in with unusual signal strength, but can hear no other Asians. Perhaps there are some on but all listening around the band. An east coast station is good dx for them, and if they hear you calling "CQ DX" the chances are they will answer you. The band is not crowded at the moment so why not give it a try? A "CQ CQ ASIA" will increase your chances of raising Asia because Asian stations know they have a better chance of raising you than if you had sent out a plain "CQ DX", which *might* result in your being called by a VK, a couple of ZL's and a W6 who has just got his license and "Pse, pse, pse, QSL om."

In fact, at the time of day when Europeans, VK's, ZL's LU's, etc. each come in best it is usually quite possible to raise them on a "CQ DX", but it is usually best to wait for a CQ from one of them or to spend the time looking for stations in less commonly worked countries. Like calling the opposite edge of the band, "CQ DX" should be considered as a "last resort" or "special occasion" expedient.

I probably have forgotten a few main pointers, but the ones enumerated will help. If they don't, you had better either look for a new location or take up ping pong. However, if you follow the suggestions given, use your head, and exhibit *listening* (not sending) perseverance, you will probably find yourself up near the top of the WAZ honor roll.

More on the Subject

By LLOYD M. JONES, W6DOB

And here we have a few additional thoughts on the subject by another well known dx man, one who has spent most of his time on 28 and 56 Mc. but takes an occassional fling at the lower frequency bands.

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The interesting subject of "DX" involves so many topics that it is really difficult to correlate them. However let us consider a few observations made by two operators at one station during the past two years.

It is the writer's belief that two things govern whether you are to be a dx man, and those two things are the *operator* and the *time* he is on the air. As for the operator, we know that you must be patient. You must be able to copy weak signals when dx signals are coming through weakly. You must be able to copy signals that are being messed up by a dozen other signals. That calls for concentration and practice. You must know where to look for the dx. Sometimes it is out of the band, and again it might be in the middle of the band, and then it might be right on the edge of the band under terrific local interference. However, when there is any dx coming through, there is usually some of it in the clear.

As for the time to listen for dx, we can only say that until you get the hang of things, be guided by the prediction charts for good conditions and really look close when you hear all the other locals calling dx. Then if Europe or Asia comes through at a certain time of the day do not expect to hear the same dx a month or so later at the same time of the day, because the time keeps changing for different seasons.

It takes hours and hours of *listening* (instead of seeing how fast you can send CQ, TEST,

VVVV, etc., or working local one after another), and if you will check up you will find that you seldom hear these dx men press their key except to call dx. To be sure they don't sit there and "CQ DX." Oh yes, I have heard some dx men "CQ DX" but they *very* seldom do it, and only when circumstances indicate one would be in order. It is ordinarily poor practice, since the DX man in a foreign country can call a short CQ and have dozens of stations call him.

To stress the point of *time,* and not location and station equipment: there are many stations that my wife, W6AET, has heard and worked that I have never heard, just because I was not there at the right time. Of course these stations are rare ones, and only come through once in a great while.

If you want to work lots of real dx, you must always be on the lookout for it. There are times when some freak condition will exist and a rare one will come through for a few minutes. You may be the only one to hear him and possibly work him.

There are very few actual "dead spots" so far as dx is concerned. I know dozens of dx men who have moved to new locations many, many times, only to set up their equipment and continue to work their dx, with other fellows within a few blocks complaining that they never hear any dx. But of course there are a *few* legitimate cases of being unable to hear dx. There are many locations which are poor for receiving dx signals from certain directions, but very few locations that are incapable of at least some kind of dx.

The antenna has something to do with receiving dx, but not a great deal. The worst type of antenna in a poor location will still yield some dx. Of course the antenna efficiency, height and gain, will determine to some extent their loudness and readability. And if your receiving antenna is such that it allows you to hear dx that most stations do not hear, you will have less competition when calling. An antenna (receiving) that increases the dx heard 25% may increase the dx worked 100%.

The receiver need not be anything elaborate in order to hear *some* dx. Here again though, the receiver sensitivity, signal to noise ratio, ease of tuning, noise silencer and crystal filter, etc., all go to make a better condition for receiving dx signals with greater clarity and enable you to hear signals from dx stations

that won't be called by half the W stations on the air.

If an antenna is quite directional, shifting its direction might bring in one or two dx signals not heard before, but in general the dead zones of any ordinary receiving type antenna in ham use are not likely to make much difference and certainly not the difference between dx and no dx.

Just because some of these "super dx men" work a dozen dx stations a night is no reason for you to expect the same. They do it because they *are* good dx men, have good receivers and transmitters, and a good location. Another point is this: if you hear some dx man talking about so-and-so being R9 plus, remember that he means he heard that signal once-upon-a-time R9 plus, and that dozens of other times the same signal was only R5 or R6, maybe less.

If your antenna is not cut just exactly right, not as high as you would like to have it, or your power is quite low, or your receiver is not the latest thing on the market, there is still no good reason why you can't work *some* dx. However, the amount of dx will depend somewhat on all the factors mentioned.

To qualify myself as having worked some dx under all the conditions mentioned, in the past two years I have used Bloopers to supers, antennas high, low, long and short, high power and low power, and all yielded dx to varying degrees. My average dx is only three or four a week with an occasional new zone or country to spur me on. I live near a main boulevard where auto ignition never lets up, or I probably would have more zones than the 35 I now have.

To sum up my slant on working dx then, learn to read weak signals, look for dx only when you hear other locals calling it, and be patient (don't expect to hear a couple of dozen dx signals every day). If you would have a score of thirty or more zones and over seventy-five countries you *must* spend hours and days looking for dx and lose plenty of sleep too!

Dx is *hard work,* not luck!

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With most applicants asking permission to increase power, it is unusual to find N.B.C. seeking F.C.C. sanction to decrease power at one of their outfits from 2500 to 50 watts. Another company has applied for a 3-watt broadcast ticket on 550 kc.

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The broadcast industry has invested a total of $40,000,000. 24,500,000 homes in the United States are equipped with sets and 4,500,000 receivers are installed in cars.

Open Forum

[*Continued from Page 18*]

posal be carried out, it would be excellent—but, even then, it does not go far enough. For example, what about this club of ours with 30 members—do we get a vote? What about the great independent group of amateurs who do not belong to the League? Why not get their views as well? Then, when we wish to go to Washington, there would be the whole amateur fraternity behind the requested ruling. In this way, I firmly believe that we could get somewhere.

If the League or anyone wishes to get the real answer to or the true cross section of any question affecting ham radio, that person or the League will have to go outside of the R. R. R. L., as well as inside the organization, for there are more amateurs who are not members in this one district alone than there are licensed members. And, in order to avoid a recurrence of what happened when it went to Washington to have the phone bands widened, the League had better get this outside vote and live up to what it says.

The League asserts that it has 90 per cent of the amateurs as members. I question this. For example, in our club of 30 members, only two belong to the League. This does not mean that we are not in favor of the A. R. R. L. We are. The League is a great thing and can do much for the amateur. I do not think, however, that the present set-up is right. Why should we join an amateur organization when the greater part of its membership are not amateurs?

What honor is there in having the certificate on our wall when anyone who sends $2.50 for QST (now understand, we think it is a fine magazine and we do read it) can get the same thing without even taking the trouble of earning his call?

If only licensed amateurs could join the League and receive certificates of membership, then belonging to the organization would have some significance and I, for one, would have that certificate displayed in my shack. But, until this is so, there will be none in my place. I know that I am not the only one who thinks this way, for in the last two years while traveling about in 14 states, I have talked to quite a few amateurs and the greater part of them do not approve of the League as it now stands.

Why are the fellows who get QST and have a receiver allowed this certificate and given the same rights (with the exception of voting) as the amateur who takes the time to get a call, then takes the time and spends the money to further amateur radio (such as the boys of flood service fame and the relay networks)?

Now, you will say that the League is OK. Yes, that is so, as far as it goes. But why, I ask, is there so much opposition to its policies if everything that it does is right? Are all of those fellows who criticize radicals? I do not believe so. In every "local" publication you pick up, there is a lot of criticism of the League. There is something wrong somewhere

or there would be more words of approval. Most of the opposition assert that the League is not run *by* the amateur, but is trying to run the amateur. This will never do, for the ham is too independent for that.

Now, if the League really wants to know how and what to do on any question and, at the same time, do the amateur a real service, it should require that anyone receiving a certificate have a call as well as the $2.50 for *QST*. Also, when a problem like that of widening the phone bands comes up, questionnaires should be sent to *all* amateurs—not only to Leaguers. Then you would get the real answer.

This is not, as I said before, intended to be just a razzing of the League. Rather, it is constructive criticism in that I have suggested something to take the place of what has been censured.

PIASA AMATEUR RADIO CLUB.
by Merle H. Hanes, W9RZT, President.

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LINES AND LOAD

There seems to be a misconception prevalent among some of the amateurs about the use of a low impedance line as a coupling medium between their transmitter and antenna system. You can frequently hear someone say, "I was using the same line to feed my Johnson Q that I am now using on this new beam but the new system loads up much easier than the old one" (or words to that effect). This of course cannot be true if the line is operating properly with both antennas.

If the said line is terminated properly at the antenna end, that is, if it is terminated with its characteristic impedance, it will always present the same load to the receiving end or to the transmitter. This becomes obvious when the theory of operation of a transmission line is considered. If the line has a characteristic impedance of 600 ohms, in order to have no standing waves upon it, the line must terminated with 600 ohms.

The moral of this little story is: if you have been using a 600 ohm line to feed one antenna system and you use the same line to feed another antenna system, the final amplifier should load up to the same amount on one antenna as on the other. That is, of course, providing the coupling is not changed between the final amplifier and the feed line. If there seems to be a difference in the amount of loading produced it means that there is something wrong in either one or both of the antenna systems. This comparison can serve as another check for standing waves on the feed line.

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Neon and carbon dioxide tubes were used as r. f. indicators as early as 1906.

5 METER INTERLUDE

By Rufus P. Turner, W1AY

The day we landed a job running a transmitter marked the wane of our active interest in amateur radio. We were rounding out our ninth year in the game and had signed calls in four different districts, but we just couldn't thrill to pumping a transmitter of an evening after doing just that all day. So it was for the first time in nearly a decade that our hamming slipped unrestrained into the limbo of neglected affairs. We didn't forget our hobby. We just left it behind. Gas stations began to get the pieces of silver we formerly passed over radio counters. Our only contact with the hobby was tooting terse CQ's at call letters that passed us on the highways.

Then came the day when the job was no more and we decided to play prodigal's return. Our yen for big batches of radio stuff was no more. Add the fact that we had migrated to a d.c. neighborhood and couldn't budget an a.c. generator at the time and you will have all the reasons why we favored simple equipment.

We still would have none of c.w., but after a cursory survey of the phone situation, we quickly ruled out 20 and 75 because of the kilowatt capers. Nor did 160 raise our temperature. So it took but little persuasion to get us going on five meters.

Hitherto, we had regarded five as little better than flashlight signalling or wig-wagging. Seemed like burning up juice needlessly to talk to chaps within earshot. But the years had satisfied all of our dx cravings and we were content with a good, old ragchew, even though local.

We launched out in the usual manner—transceiver on the table. Had lots of fun at first with that little box. Even took it motoring. But the number of five-meter stations in Boston is exceeded only by the number of baked beans they serve on a plate there, and very often we were QRM'd right out of the picture though a transceiver is like an eel when it comes to QSY.

So we thought we would show our oats too. Along came our higher-powered modulated oscillator and a rotary converter to push it. We tuned in some vile smelling signals manufactured by other modulated oscillators, and listening outside revealed that ours was every bit as bad. To our mind, our call was much too venerable to be disgraced in such fashion; so m.o.p.a. took the stage at our roost and close on its heels came crystal control. We followed a 40-meter crystal stage with a string of others—doublers on 20, 10, and 5; a 5-meter buffer and 5-meter final.

It was gratifying to our old heart to receive continual fine business reports on the sharp signal put out by this rig. We were indeed a big fish in a little pond and we became possessed of much *armour propre*. But we despaired at the none too encouraging reports on speech quality. Intent to make our modulation all that it should be, we dripped sweat and raised blisters at the audio end. The French telephone handset and its single-stage amplifier went the way of all flesh. But again we were distressed because the new double button and its amplifier were nothing to roar about.

At length, we cussed carbon mikes from their earliest ancestors and laid out the price of a good watch for a high-grade velocity mike with all its trimmings. We adjusted and readjusted the amplifiers so many times that inadvertently we began yapping *hello test* into the desk lamp at work. When the job was done, however, and the new audio dingusses were tied in with the transmitter; we were well rewarded for our pains, for our monitor told us and the boys

told us we had both a knife edge signal and good quality. Verily, we were riding the joyful crest of the wave.

But it was not for us to have smooth sailing, not even on five meters. Such has been the curse of the Clan. For, temporarily forgotten, the old ogre QRM had not buried his ugly face for good. The other boys in town were pushing their power to the sky, crystals, m.o.p.a.'s, and modulated oscillators alike. The race was to the loudest. So into our final went larger tubes. And, mind you, by this time we had begun to gather up a higgledy-piggledy array of units into a floor rack.

Our only reward, though self-sufficient, was the gratification of having an outstanding signal in the multitude of grunts and rasps that *is* five meters. But we did not relish the vulgar company.

We wanted, above all, nothing complicated and large when we returned to amateur radio; so we started out simple enough with a desk transceiver on five. But when the gab department of our station grew into five feet of trappings with six r.f. stages between the crystal and antenna; five audio stages between the mike and modulated amplifier; well, our old love for twenty-meter phone just welled up in us again and we tossed an *au revoir* back at the band where so many signals are just smears on the dial. We were leaving five.

"Man proposes; God disposes."

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LAST MINUTE DX NEWS

From our faithful correspondent, Johnny Hunter, G2ZQ, we learn the following. The new prefix for Burma is XZ. The calls are the same as before; in other words, Z2DY is now XZ2DY. The QTH of FN1C, 14,200 T9X, is: D. W. Patterson, Gondalpara Mills, Chandernagore, E. I. Railway, Bengal, French India. He tunes from the low frequency end of the band, and is the only ham in the country.

Some more QTH's that Johnny sent in:

CN1CR, 14,440 T7. Signor Cristiani, Italian Councilate, Tangier.

TA1CC, 14,310 T5. Emile H. Urkecz, Aldurk Strass 28, Rt. 11, Angora.

YI2BA Iraq

Two stations have reported working YI2BA in Iraq. The first was Larry Barton, W6OCH and he did it on fone which made his 26th zone on fone. When Larry worked him his frequency was approximately 14128 kc. and the time of the QSO was around 0200 G.m.t. W8DFH also hooked up with him and gives his frequency is 14,110 kc. and T7. YI2BA told 8DFH that he is after W contacts and is usually on between

2330 and 0230 G.m.t. The QRA obtained by DFH is: Mr. Norman, YI2BA, c/o Port Directorate, Maquil, Basra, Iraq. This is a good one for you fellows who need Zone No. 21.

W2JOG hooked ZB1L on the island of Malta and gives this dope . . . T9x and 14,250 kc. W2JOG was only using 25 watts . . . But the antenna was one of those very popular Johnny Kraus, W8JK beams. W8LZK worked the NEW EL2A, and says he rolls through just as good or better than 8BIS did when he was there. He is using the beams that the old EL2A left behind. EL2M is also on the air in Liberia, so between the two we all should be able to add 'em to our list. W5GBY has been hearing a station signing XOH2FJ. He says it sounds like a Finnish station aboard ship. Can't tell . . . might be. W7FCD says that VP2CD wants Nevada, Idaho and Wyoming. A SWL in Fort Bragg, Calif. writes and says he received a card from YL2CD, who needs Arizona ,Nevada and Utah. This SWL, a budding ham named Archie Colquhoun, also says that YV5AO told him that he was using a single 6L6 xtal oscillator with just a few watts.

G2ZQ informs this department that his y.l. is home from college again, so will be QRT for a while. John calls me on the way G6WY's name came out in last month's column. Had it Van Whyte when it should have been Ham Whyte.

G6GH has his 33d zone tucked away now by working Chile. He informs us that ST2LR and ST2BN are both genuine licensed stations in Egyptian Sudan. ST2LR who I think is ex-G2LD is a pal of G6GH, and is on 14360 kc. with a c.c. rig . . . 30 watts input.

Norol Evans, W6LYM now has 37 zones and 81 countries. Norol is the prexy of the Orange County Radio Club in Santa Ana, Calif. Must hand them a blue ribbon for having the most dx minded club ever visited. All the boys from 15 years of age and on up, have some of the best antenna layouts ever seen in one locality. They think nothing of talking in terms of VEE beams and Rhombics . . . and power . . . wow, don't mention it. Looks more like a proving ground for some tube outfit. Those that do not already have a kw. are planning on it pdq. It is a rather strange coincidence, that so many of the boys have their antenna systems laid out over the walnut groves, and every one of theim is enjoying very good dx . . . including the boys with low power. One of 'em said he used to have his antenna over an orange grove, but that his dx picked up immediately upon changing his antenna to over the walnut grove. Sounds sort of nutty . . . doesn't it. (Couldn't pass that one up.) A few of the gang that come to my feeble mind offhand are: W6JGG, W6BAM, W6BXI, W6LYM, W6NSA.

5 Meters

W6OFU, Dick Sampson of Jerome, Arizona is on 57,864 kc. every night from 9:00 to 11:00 m.s.t with 50 watts xtal controlled i.c.w and fone. His sig in semi-directional, favoring the northwest. OFU says that W9VHR in Omaha reports that W9CCY is on nightly from 11:00 to 12:00 c.s.t. W5EHM is often heard by W6OFU on 5 meters. This should be of considerable value to you u.h.f. dxers.

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RADIODDITIES

W6HOM is licensed to a fellow named *Hom*. K6KDX thought he was working him one night, and he remarked that it must be nice to have a call made up of one's entire last name. Guess the color of his face when his QSO happened to be W6HOG instead.

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Seeking relief from a toothache, VE4UN decided to ask the first ham he worked what to do. The first one he worked was W3HG, a dentist!

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It is unlawful to run a radio in a Boston hotel lobby on Sunday without a special permit.

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In chemistry, a condenser is usually a coil.

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Uncle Ezra, "m.c." of Alka Seltzer's *powerful little five-watter*, pulled a new one on us—*sign-on*, for coming on the air.

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The d'ctionary does not sanction use of the word radio as a verb.

◆

There are 515 more kilocycles in the 5-meter band than in all the other ham bands together.

Upping Phone Output Ten Db[1]

Following publication of an article by Ray Dawley, Technical Editor of RADIO, on the subject of high pass filters for speech amplifiers[2], we received a letter from Sam Lutz, (W9TJB) of West Lafayette, Indiana suggesting that a 10 db improvement could be obtained in a phone transmitter by using "scientific volume compression and expansion". We were inclined to say, "and just what is that?" Here is an outline of the system as in actual use commercially.

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In ordinary amateur practice, the amount of modulated signal that may be transmitted is limited to the point where the carrier is modulated 100% of its capability (or at least it should be). At this point, the weaker speech components are considerably below the peak value of strong syllables, but nevertheless, these weak elements of the speech are very important to the understandability and apparent volume of the speech when received at a distant point. This is well illustrated by the increase in received strength when the modulation percentage is run up to the point where the peaks are chopped off because of overmodulation. It is obvious, then, that anything that will permit a higher modulation percentage on the weak parts of the voice without causing the peaks to overmodulate will increase the phone transmitter's average output, and even more important, increase the value of the weak consonants.

Radio noise often limits transmission, especially for the weaker voice waves. The range of intensities is about 30 db even when the volume is controlled manually to the point where strong peaks overload the transmitter. A reduction in this 30 db range will of course increase the average amplitude of the modulation, maintaining 100% for the peaks. Such a reduction can be obtained through the use of a compressor.

Volume indicators are universally used in broadcast service, and should widely be found in amateur stations. These indicators are adjusted to be insensitive to extremely high peak voltages of short duration. Their maximum deflection is proportional approximately to the mean power in the syllable. The ear, it has been found, does not detect amplifier overload-

[1]The complete article on this subject, "The Compandor—An Aid Against Static in Radio Telephony", by R. C. Mathes and S. B. Wright, will be found in the *Bell System Technical Journal* for July, 1934.

[2]"More Intelligible Radiotelephony", by Ray Dawley, W6DHG, RADIO for February, 1937.

ing on the extremely high peaks of short duration. This device does not indicate the weakness of some components of the voice train.

The sound energy in the speech amplifier is made up of tones of different pitch and amplitude. There are two limits to the range of volumes that a system can transmit. The upper limit is set by the point at which overloading appreciably impairs the signal quality, or endengers the life of the equipment—and legally, 100% of the modulation capability of the transmitter. The lower limit is set mainly by the amount of interference which may appreciably mask the signal. This limit in a radio circuit is largely set by the received signal level which may be below that of thermal noise in the antenna and receiving apparatus, or by the strength of interfering stations. Thus, even in the absence of static there is a definite lower limit to the received volume satisfactory for communication.

At present, the only commonly used method of reducing the range of signal intensities is the gain control, adjusted to load the transmitter to capacity on occasional peaks. However, even with the speech adjusted to constant volume, there are large variations in signal intensity from syllable to syllable and within each syllable. The energy of some consonants as compared with the stronger vowels is down about 30 db. In the case of commercial telephone sets, a steady noise 30 db below the energy in the strongest parts of the speech syllables produces an appreciable impairment in transmission efficiency. If this range of 30 db can be compressed to 10 db, it is evident that the signal will be stronger, more understandable in the presence of noise, or the transmitter power can be reduced for equal communication efficiency.

Available Methods to Reduce Range

The problem can be approached in several ways. As many of the weaker consonants have their chief energy contribution in the upper part of the speech band, a simple equalizer[3] which relatively increased the energy of the higher frequency consonants before transmission and another which restored the frequency-energy relations after transmission, should be found of value. Commercial tests have confirmed this expectation to some degree.

Another general method of approach is that of amplitude distortion in which the weaker portions of the syllables are automatically increased in intensity in some inverse proportion to their original strength. Such a device[4] which may be considered approximately as a control varying as a function of the signal envelope, has been developed. This is called a *compressor;* the receiving device, an *expandor;* and the complete system, the *compandor.*

The Compressor Circuit

The variable loss in the compressor consists of a high impedance pad in the circuit through two high ratio transformers. The high resistances are shunted by a pair of control tubes connected in push-pull. The push-pull arrangement is desirable for two reasons. It reduces the even order of non-linear distortion effects caused by the shunt path on the transmitted speech; and it balances out the control impulse and the unfiltered rectified speech energy from the control path which might otherwise add distortion to the speech. The impedances of the tubes are controlled by a control voltage taken from the output side through a linear rectifier and filter condenser. With this circuit, the per cent

[3]An approach that is quite similar, that of using a high pass filter on the transmitter with no correction at the receiving end, has been suggested by Mr. Dawley. See "More Intelligible Radiotelephony", RADIO, February, 1937.

[4]U. S. Patent 1,738,000, December 3, 1929, issued to E. I. Green; U. S. Patent 1,757,729, May 6, 1930, issued to R. C. Mathes.

A GENTLE
REMINDER

THAT RADIO PUBLISHES NO
AUGUST OR SEPTEMBER ISSUES

◆

THE NEXT ISSUE IS THE OCTOBER NUMBER, OUT THE MIDDLE OF SEPTEMBER.

change in relative speech voltages in passing through the compressor is the same at all points in the intensity range.

The expandor circuit employs resistors kept small compared with those of the control tubes. This circuit is placed at the receiving end to reproduce the normal relationship, which it will do when the expansion ratio is the same as the compression ratio. When a compressor and expandor having the same ratios are put in tandem—even with the transmitter, space, and receiver between—the output and input intensity ranges are the same. Such devices have been built with a compression ratio of 1/2 and an expansion ratio of 2, the compressor operating substantially linearly over a 45 db range of inputs and the expandor over a 22.5 db range, sufficient to reach over the normal 30 db of voice intensities at constant volume. The new range of intensities is reduced to 15 db before expansion.

Tests show that a volume indicator on the output of the compressor reads from 1 to 2 db higher than on uncompressed speech at its input. Compressed speech sounds slightly unnatural, but the effects of compression upon articulation in the absence of noise are negligible. The compressor can be used on the transmitter without the expandor at the receiving end.

What the Expandor Does

In considering the action of the expandor it is important to note that all of the improvement in signal-to-noise ratio is put in by the compressor. Considering any narrow interval of speech the insertion of the expandor does not change the signal-to-noise ratio. The desirability of using it depends on other reasons. First, it restores the naturalness of the speech sounds. Second, the apparent magnitude of the noise is greatly reduced since noise comes in at full strength only when speech is louder and is reduced by the loss introduced by the expandor at times when the energy is low between syllables. When no speech is being transmitted, noises up to a certain limit, which corresponds to the maximum energy in received speech, are reduced in amounts varying from about 20 db to zero depending on their value.

For a circuit having somewhere near the limit of static, the use of the compandor allows on the average 5 db more noise than when it is not used. When the noise is less than this limit, somewhat greater improvements are obtained, ranging up to at least 10 db.

The particular values of compression and expansion ratio were chosen initially for the relative ease in the design of the system with commercially available vacuum tubes whose characteristics closely approximated a parabola.

There are two major sources of possible speech distortion which must be considered in the design and use of these devices in addition to those ordinarily present. The first is due to the non-linear characteristics of the vacuum tubes used for controlling. The even order distortion terms are largely balanced out by using two tubes in a push-pull arrangement. The remaining distortion is minimized by having speech pass through the control tubes at a sufficiently low level. In the operating ranges for the devices described, the harmonics of a single-frequency tone are 30 db or more below the fundamental. The reproduction according to an examination of oscillograms is perfect when a low-pass filter is used in the control circuit.

A compandor system of this sort has been in service on the New York-London long-wave radiotelephone circuit since about July 1, 1932. Tests have indicated that its presence does not affect the quality appreciably. Its use has increased the time that the circuit can be used for service. In amateur work, it might alternately be applied to a reduction of the transmitter power.

◆

Dwight Stebbins, W9WLK, has built and demonstrated a motor that runs on static.

RADIODDITIES

The following is an extract from the ancient and honorable *Operators Wireless Telegraph and Telephone Handbook*:

"The Audion has proven very sensitive for use in wireless telephony, yet it is doubtful if it will ever come into wide use, owing to the difficulty in manufacture and short life. Usually quite a number of Audions have to be tested out before one sensitive enough for general use is found."—W9WUV.

◆

W6OCH's phone signals come in over a next door neighbor's wash-bowl drain pipe.

◆

At least three of the big RCA transmitting tubes list at over a thousand dollars each. So you think your kilowatt tubes cost money?

◆

Nothing new under the sun—Ballantine described resistance-coupled i.f. amplifiers fifteen years ago.

◆

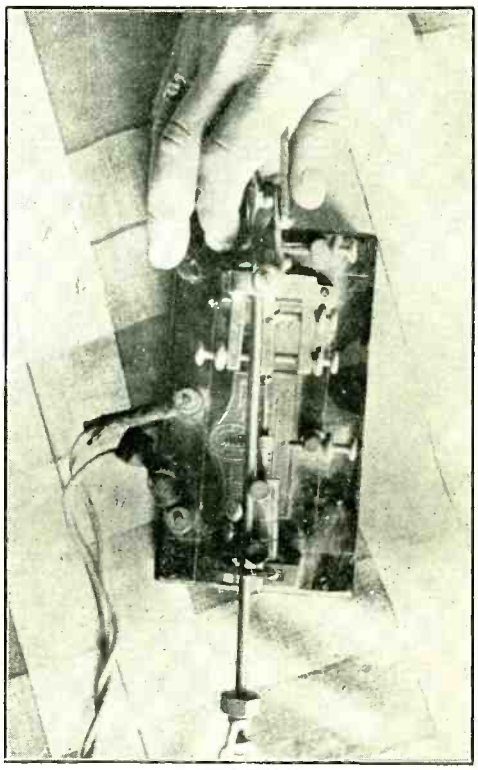
Electric in name only are many products today. Examples are *R. M. S.* safety matches and *QRS* movie gear.

◆

The old philosopher ponders that now since we have push-pull and push-push, we only need *pull-pull* for a complete picture.

◆

The Minute-Man 5-meter club of Greater Boston is circulating a petition, asking that the region between 56 and 57 megacycles be set aside for crystal-controlled and m.o.p.a. rigs. Hams interested in the project are urged to communicate with W1CTW.



Picture of a bug with hobbles. Vibroplex slowed down for dx work. Contax II used, with 30 cm. Contameter attachment.—W5NT.

Thedore Buschgasch was broadcasting news, entertainment, and educational features over telephone lines to 6,000 subscribers in Budapest in 1893. He called his service *The Telefon*, and offered advertising at the rate of one florin for each 12 seconds of gab.

◆

A degree of secrecy on c.w. may be secured by using the American Morse code. A large number of fellows can't read this code.

◆

Our idea of something urgently needed is a code symbol for the Bronx cheer.

◆

The FCC has appointed Mr. Thomas J. Slowie to the position of Secretary. Henceforth his name will grace our tickets.

◆

W9VSR is the closest ham to the geographical center of the country. His QRA is only 15 miles from the exact spot.

◆

W8FYN reports a 100 percent QSO over a distance of 35 miles, loop-modulating a regenerative receiver.

Osockme, Japan.

Hon. Editor of RADIO,
Dear friend or such:

It are most exasperating to Scratchi, Hon. Editor, how such common fokes as BCL lister-inners can make so many complaints of QRM from hamfones when principle cause of such trouble are in prehistrionic receivers which such BCL complainers are use. Scratchi have pleasant love-thy-neighbor-as-themselves people next door who make continually complaint to local Radio Inspecktor's office in regard to Scratchi QRM, even when Scratchi are away on vacations or such. Scratchi are expert radio engineer, Hon. Editor, as are approved from many correspondence school certificates which hang on Scratchi's wall, in additions to beautiful pink certificate from Federal Complication's Commission which certify to wit: "Please Reply" unquote.

Scratchi make visit to next door neighborhood to find out what are reason for such complaints from neighbor. He are pleasant looking sole when he greet me at doorstep, until he find out who my name and call letter are. Then his smile turn upside down and he chatter his false teeth at me and shake his fist in my faces. I pacify him by pulling white hankercheese out of my pocket and make motion of surrender. He then stop oscillating and ask me to come into his house. Which I do. He tell me that it are no longer possibull for him to enjoy his BCL receiver because of QRM splatter from Scratchi hamfone. He tell me to make telephone to Mama Scratchi so she can talk into transmitter rig while the two of both of us listen in on neighbor's receiving set. Mrs. Scratchi open up with full power of entire seven whats and call "Seek You".

We hear her voices fine. Very much to fine, Hon. Ed. She say "Do you hear me, Scratchi?" Then damphool neighboor put his face right in front of loudspeaker on his receiver and start talking back to Mrs. Scratchi. He think it are only necessary for a BCL to talk into speaker of his receiver in order for make conversation by radio. He have yet much to learn. Only a license radio ham can try such stunt and get away with such.

It are evidence to Scratchi that QRM from my hamfone are raising plenty of fuss in BCL receiver, so it now become necessary for Scratchi to cure such interfearance. I first go home and get all my tools, which consist of long-snooted pliers and roll of friction tapes. I cut BCL antenna wire in six places and patch together with tape, for purpose of making six condensers is serious with receiver antenna connection terminus. No more signals from Scratchi hamfone are now coming in and there are a broad smile on BCL neighbor friend. He think to himself that Scratchi are genius, but Scratchi think that Barnum are still greater man. Only difficulty with BCL receiver now are that not much BCL music are coming in also. BCL neighbor then become suspicions. So Scratchi run home and get single-pole-single flip switch which I put on side of neighbor's BCL receiver, so that when he thro such switch closed, it make connection with BCL antenna, and when switch are open, Scratchi can work hamfone, without BCL neighbor hearing such. Scratchi give minute instructions to BCL friend on how to use such knife switch properly. Scratchi then run home to give demonstration to BCL listener.

When Scratchi come back to BCL neighbor friend house to see how demonstration function, he find BCL friend stretched out on floor. He have become completely demised.

Scratchi make hurry-up call for Coroner and he come quicker than usual and pronounce BCL neighbor no longer in living state of existence. He also call poliseman who know what to do with Scratchi even before Coroner have chance to speak pieces.

Scratchi were hailed before Hon. Justices of Pieces and pronounced guilty even before Scratchi can make speech. Scratchi were then next condemned to deaths by elocution because Hon. Judge were of opinion that BCL neighbor friend were electrocuted by high voltage from Scratchi's hamfone coming through BCL receiver antenna wire. Scratchi were given four hours in which to make appeal to Soupreem Courts, but such Courts were not in session after midnight, and Scratchi were prepared for sit in hot chair. It were not necessary to shave hair from off of Scratchi's head because there were no hair there already. Such have years ago worn off of Scratchi's head from wearing earfones and from pulling out one hair at each time when Scratchi have deep thinking to do.

Scratchi have no fear of death by elocution in sizzle seat because it have been common practice for Scratchi accidentals to grab hold of high voltage lead of transmitter power supply and Scratchi know that he are immune from being kilt in such manner.

Executioner put electrode on Scratchi's head, and wrap another electrode around Scratchi's foot, whereup Scratchi make protest that such electrode must be put on other foot because such foot on which electrode are now fastened are foot which Scratchi always make use to send with. Executioner are oblidging people, so he do what Scratchi ask.

Just as executioner are ready to throw big switch and start generator whizzing to send Scratchi to faraway place, door to execution chamber slam open and friend Coroner rush madly into room with hand upraised to stop execution of Scratchi. Coroner have just make finding that friend BCL neighbor were not killed by spark from Scratchi's transmitter, but by simple fact that he laugh so hard when he think that he will get no more QRM from Scratchi's hamfone that he swallow his false teeth and choke himself to death.

That were a close shave, Hon. Editor, and Scratchi feel very much relieved that he can still communicare with you in person, rather than in spirits.

Yours Truly,

HASHAEISTI SCRATCHI.

The Question Box

I am grid modulating a pair of 50T's in the final amplifier of my phone rig. All the operating conditions, as far as I am able to determine, are the same as described by Mr. Olesen in his article in the Nov. 1936 RADIO, *yet I am not able to get the stage to modulate up properly. What do you suggest that I do to remedy the trouble?*

One of the most important considerations in getting an amplifier to operate in the manner as described by Mr. Olesen in his article is the value of plate load used on the tubes. In this type of amplifier it is quite important that the tubes work into quite a low value of load impedance. This of course is obtained by using tight coupling between the antenna and the plate circuit of the modulated amplifier. If, however, when the coupling is increased the tubes draw excessive plate current and tend to heat unduly, decrease the amount of excitation being applied to them. By judiciously juggling the excitation and antenna coupling, linear modulation may be obtained up to about 90% and the modulation is only slightly non-linear at 100%.

I am operating on 160 meter phone. What would you recommend as the best type of antenna for this band. I have a good ground available and recently I have been tuning an 80 meter zepp against this as a Marconi.

Recent investigations by NBC have shown that for general coverage of frequencies in this vicinity a vertical radiator of about 190 electrical degrees is best. This corresponds to an antenna length of about 280 feet on this band and for best operation it is important that the first 150 or so be up in the clear. Of course this is out of the question but as the most important thing seems to be to get the current peak above the ground as far as possible a simplification can be made to fit the needs of the amateur. An excellent 160 meter antenna is a ⅜ wave Marconi, in other words one that is about 135 electrical degrees long. It is only important that the first 50 or 60 feet be up in the clear, the balance of the 190 or so feet can be run in any manner convenient. It should be remembered when putting up the antenna that this current peak will occur at about 130 feet from the open end, depending upon the frequency that is being used.

BUYER'S GUIDE

Where to Buy It

CALIFORNIA—Los Angeles

Radio Supply Company
912 So. Broadway

THE AMATEURS' HEADQUARTERS OF THE WEST

All Nationally Advertised Parts for Receiving and Transmitting Carried in Stock at All Times. 9 Licensed Amateurs on Our Staff.

ILLINOIS—Chicago

CHICAGO RADIO APPARATUS CO., Inc.

Established 1921

415 SOUTH DEARBORN STREET
(Near Van Buren Street)

ALL SUPPLIES FOR THE SHORT WAVE FAN AND RADIO AMATEUR QUOTATIONS FREELY GIVEN ON ANY KIT OR LAYOUT

Short Wave Receivers Taken in Trade
Get our low prices

MARYLAND—Baltimore

Radio Electric Service Co.
3 North Howard Street
Baltimore, Maryland

MASSACHUSETTS—Boston

THE RADIO SHACK
46 Brattle Street

Ham Goods—Bought, Sold, and Traded

NEW YORK—New York City

Harvey Radio Company
103 West 43rd Street
Operated by W2IJL and W2VL

WASHINGTON—Tacoma

C. & G. RADIO SUPPLY CO.
714 St Helena Ave.

Electrical, Sound, and Radio Equipment

PARTS REQUIRED FOR BUILDING EQUIPMENT SHOWN IN THIS ISSUE

The parts listed are the components of the models built by the author or by "Radio's" Laboratory staff. Other parts of equal merit and equivalent electrical characteristics usually may be substituted without materially affecting the performance of the unit.

Dawley Amplifier

C_3, C_5, C_{11}—Aerovox MM25 25 μfd.
C_8—Aerovox PBS 5 8-8 μfd.
C_6, C_9, C_{10}—Aerovox WG5 8 μfd.
Other condensers—Aerovox 484 tubulars.
R_6—Yaxley N potentiometer
R_{14}—Ohmite 20 watt Brown Devil
R_{15}, R_{18}—Ohmite 10 watt Brown Devil
R_{16}, R_{17}—Aerovox 930 resistors
All other resistors—Aerovox 1 watt carbon
T_1—Jefferson 464-431 transformer
T_2—Jefferson 465-261 transformer
T_3—Thordarson T-11M75
CH—Jefferson 466-470 choke
Chassis—Bud 1127
Plug and receptacle—H&H MB plug, 757 recept.

Smith Antenna Coupler

C—Cardwell type XT-210-PD
L_1—Decker series B, 80 m.
L_2—Same, 20 m.

INDEX OF ADVERTISERS

The Marketplace

(a) Commercial rate: 10c per word, cash with order; minimum, $1.00. Capitals: 13c per word. For consecutive advertising, 15% discount for 3d, 4th, and 5th insertions; 25% thereafter. Break in continuity restores full rate. Copy may be changed often as desired.

(b) Non-commercial rate: 5c per word, cash with order; minimum, 50c. Available only to licensed amateurs not trading for profit; our judgment as to character of advertisement must be accepted as final.

(c) Closing date (for classified forms only): 25th of month; e.g., forms for March issue, published in February, close January 25th.

(d) No display permitted except capitals.

(e) Used, reclaimed, defective, surplus, and like material must be so described.

(f) Ads not relating to radio or radiomen are acceptable but will be grouped separately.

(g) No commissions nor further discounts allowed. No proofs, free copies, nor reprints sent.

(h) Send all Marketplace ads direct to Los Angeles accompanied by remittance in full payable to the order of Radio, Ltd.

(i) We reserve the right to reject part or all of any ad without assigning reasons therefor. Rates and conditions are subject to change without notice.

WANTED: Editorial assistant for RADIO. Must type, be familiar with amateur radio, have journalistic experience. Willing to move to California. No others need apply. Write to RADIO, 7460 Beverly Blvd., Los Angeles, giving experience, background, age, salary desired.

METERS—brand new Jewell 3.5" bakelite cased meters. Patt. 88 0-1 ma., $3.45. Ranges from 8 to 750 ma., $2.95. Patt. 68 thermocouple type r.f. meters, ranges from 250 ma. to 20 amps., $4.00. 4.5" Patt. 54 0-300 microamps., $3.50. Also a.c. and d.c. ammeters, voltmeters. W2CXY, Hillside, N.J.

BRETING "12" with xtal. Best cash offer takes. O. E. McCartney, Jr., 806 North Crescent Drive, Beverly Hills, Calif.

A STEAL . . . . Complete 75-160 meter fone station. X'mitter, 50 watts out, 13 tubes, quick change. National NC-100. Will demonstrate. $150.00. . . . . Also, three dynamotors, 10 to 350-450-750 volts. Several (new) pairs of power tubes. W6AJR. L.A. Phone: JEfferson 4736.

QSL's—Introductory offer continued. Highest Quality—Lowest Prices. Radio Headquarters, Ft. Wayne, Ind.

MOVING: Must sell. Transmitrers, receivers, power packs, tubes, coils, xtals. Monitor. Parts. Call, write W1HIL, 51-A North Avenue, Melrose, Mass.

WRITE us for trade-in price on your old receiver. We buy meters. Walter Ashe Radio Co., St. Louis, Mo.

QSL's—SWL's—Prices Reduced! June, July. Stock up! FRITZ, 203 Mason Ave., Joliet, Illinois.

WEAK HEADPHONES rejuvenated scientifically. Makes them like new. Any except crystals. 70c per pair in U.S.A. (no stamps). Postpaid, insured. W2AMP, Box 731, Newark, New Jersey.

RCA Studio Type condenser microphone in "NBC type" square cast box. Used, but in perfect condition. Rebuilt to use 30 type tubes. 500-ohm line output. Operates from 6 volts and 135 to 180 volts from battery or power supply. $15.00 complete with tubes. WE-2i2E, used, perfect, $15.00. W. N. Johnson, 6159 Annan Way, Los Angeles, Calif.

RADIO's classified ads bring results. Rates are low—only 5c a word for licensed radio amateurs not trading for profit. Commercial rate, 10c per word.

MOBILE TRANSMITTER CASES for transmitter shown in April issue, page 22. 10x8x6". Crackled steel. With chassis. $2.50 each. R. H. Lynch, 970 Camulos, Los Angeles, Calif.

SELL—SW-5 complete. 14 coils. $15.00. W6AVR c/o 230 South G Street, San Bernardino, Calif.

SELL: Harvey RK 20 Xmitter. Commercial rack, power supply, xmitter, antenna unit in one rack. FBXA 80 and 40 coils. Peak pre-selector, speaker, monitor, power supply, bug. Everything in the station. First $100, plus freight, takes all. 940 Northampton, Buffalo, New York.

CRYSTALS—A-cut, 80-160 meters, within one kc., $1.95. Guaranteed strong oscillators. Vollmer Radio Lab., Route 8, Box 72, Portland, Oregon.

TRADE: Eastman model 20 Cine 8 movie camera for good standard ham receiver or xmtr. parts. W6MUP, Nogales, Arizona.

QSL's—Introductory offer continued. Highest Quality—Lowest Prices. Radio Headquarters, Ft. Wayne, Indiana.

TRADE used $144 Supreme AAA-1 Diagnometer for Graflex, Recomar, or what have you? Herbert Wallis, KWTO, Springfield, Mo.

SWAP—good time for your personal appearance at Stockton A.R.R.L. Convention, September 4, 5, and 6.

WRITE us for trade-in price on your old receiver. We buy meters. Walter Ashe Radio Co., St. Louis, Mo.

USED Western Electric Amplifiers and equipment: 8a, $25; 8B, $35; 17B, $55; Volume Indicators, $20; 10A, $35; Rectifier panels, 1B, $59; 6000A, $75; 514A Meter Panels, $17.50; 57AF Condensers: 2Mfd, 59c; 95D, 1Mfd., 75c; Assorted transformers, chokes, resistances, condensers and Weston meters. List available. Mass Radio, 26 Willoughby Street, Brooklyn, N.Y.

THE 18th Pacific A.R.R.L. Convention will be held in Stockton, California, September 4, 5, and 6.

QSL's. 300 one-color cards, $1.00. Samples. 2143 Indiana Avenue, Columbus, Ohio.

CRYSTALS: 40 and 80 meters, $1.60 and they're "T 9's"—nuff sed. Ceramic holders, $1.10. Prices postpaid. W5AMK.

STEEL cases built to fit your requirements. Low prices. Write R. H. Lynch, 970 Camulos, Los Angeles, Calif.

COMPLETE training for all Amateur and Professional Radio licenses. New York Wireless School, 1123 Broadway, New York.

WANT to make some extra change during the summer vacation? Write and tell us about that new transmitter of yours or other apparatus around the shack that make the boys sit up and say, "Whew." RADIO buys between $150 and $200 worth of articles every month. Write 7460 Beverly Blvd., Los Angeles, for details.

OUR 75c crystals for 160 and 80 meters are fine. Letters of praise arrive daily. Faberadio, Sandwich, Illinois.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Polk Street, Valparaiso, Ind.

Announcing

TWO NEW ZERO BIAS TUBES

TZ20 • • • • • • • • • 203Z

$2.45 **$8.50**

Another great forward stride for Taylor Tubes. Here are two new tubes that are sure to lead the way in Class "B" usage. Designed for maximum performance at value plus prices, the 203Z and TZ20 have been added to Taylor Tubes mighty sales champion line. Amateurs!! Now more than ever you can build 100% Taylor Tube equipped rigs. Insist on "More Watts Per Dollar!!" Full details and prices on these new tubes are given in Taylor Tubes new FREE 1937 Catalog and Manual which is now ready.

NEW TAYLOR MANUAL READY

Contains—Technical articles—Circuit diagrams—Suggested "Rig" layouts for all bands and power—L/C charts—Page on page of vital important information which you can use and need. Entirely new throughout! Absolutely not a reprint of the now famous first edition. Every amateur and radio engineer must have this fine new manual and catalog to keep up to the minute. Don't waste a second—get your copy NOW. It's big— It's FREE.

FREE — Write us or see your distributor — FREE

"More Watts Per Dollar"

Taylor HEAVY CUSTOM BUILT DUTY Tubes

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS

It isn't what you put in that counts—

It's what you get Out

Use RCA Tubes to be sure of better performance at high frequencies

IT seems to us that much emphasis has been placed on tube input ratings with little regard to tube and circuit efficiencies and the resulting output. After all, the other fellow only hears what you put into the antenna—not what you put into the final stage. Why gamble, therefore, with the operation of your transmitter? Give it a good start by designing it around RCA tubes. There are many types to choose from which will give you long, reliable service at high efficiencies.

High plate efficiencies in many tubes are obtainable only at very high plate voltages. This means costly power-supply equipment. RCA offers you a line of tubes designed to give high efficiencies at reasonable plate voltages, thus permitting you to save money on your power supply equipment. The money saved can be used to improve other portions of your transmitter.

Efficiency at ultra-high frequencies is an important matter. Naturally, overall circuit efficiency is lower. Don't let the tubes be the weak link in the system—use RCA ultra-high-frequency types which have been carefully designed and rigidly tested to assure good ultra-high-frequency performance.

For full information on any RCA type, see your supplier, or write to

RCA 801

RCA 802

RCA 803

RCA 805

RCA 807

RCA 808

RCA 834

RCA 866

RCA

for Amateur Radio

AMATEUR RADIO SECTION

RCA Manufacturing Co., Inc., Camden, N. J. · A Service of the Radio Corporation of America