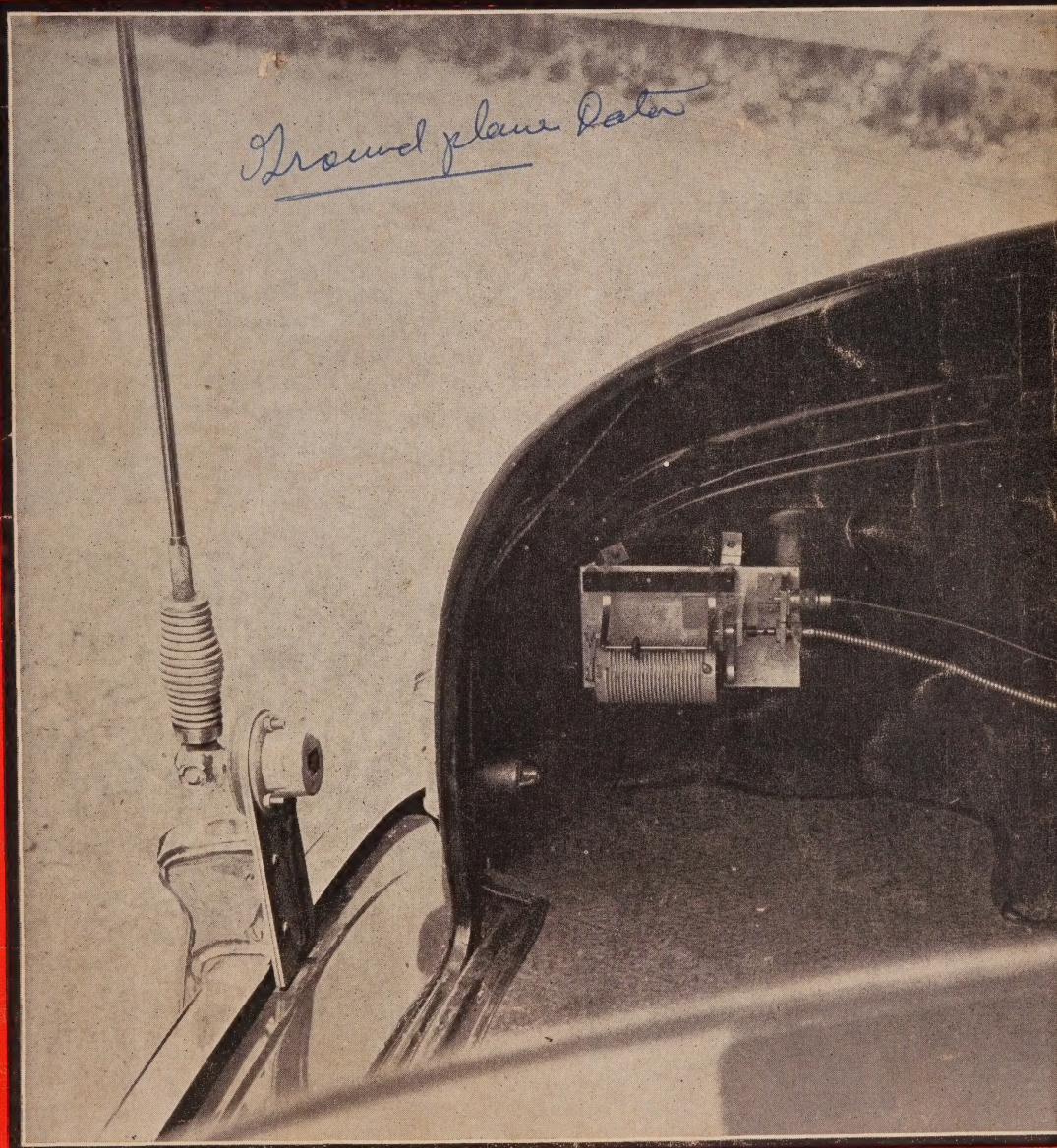
CQ RADIO AMATEURS' JOURNAL

JULY
1952

W7KT



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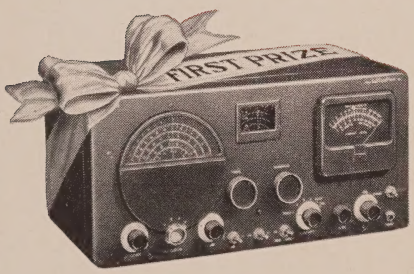
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Here are the "FIRST TEN" Novices who have qualified under Hallicrafters 1951-52 Awards . . . and the winners of the famous Hallicrafters S-76 Receivers!



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W6NDP	Ken Lamkin 4717 Huntington St., Fresno, Calif.	**W5TFP**	Ray Thacker, 725 Cherry Ave., N.W., Ardmore, Okla.
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S-76

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9-Pin Miniature Beam Power Amplifier

Heater voltage, a-c or d-c	6.3 v
Heater current	1.2 amp
Max plate voltage	250 v
Max plate dissipation	9 w



GANGWAY FOR HIGH SENSITIVITY plus real audio wallop! With just a few volts' drive, the new 6BK5 will put out enough power for BIG speaker response!

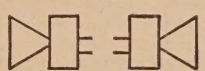
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35L6GT	requires 8 v drive to put out 3 w
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YOU'LL FIND MANY WAYS to apply this new G-E marvel that hears more, and repeats it loudly! A 1-tube phono-amplifier for the junior op.—the power-output stage of your new receiver—an improved circuit for your home-entertainment amplifier—these are among the numerous possibilities.

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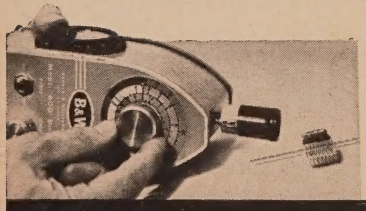
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VOL. 8, NO. 7
JULY, 1952

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CONTRIBUTING EDITORS

Herb Becker,	W6QD
Frank C. Jones,	W6AJF
G. F. Montgomery,	W3FQB
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S. L. CAHN,	Adv. Director
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Branch Offices: Ted E. Schell, 112 West 9th Street, Los Angeles 15, Calif. Vandike 8921.

Foreign Subscription Representatives: Radio Society of Great Britain, New Ruskin House, Little Russel St., London, WC 1, England. Technical Book & Magazine Co., 297 Swanston St., Melbourne C1, Victoria, Australia.

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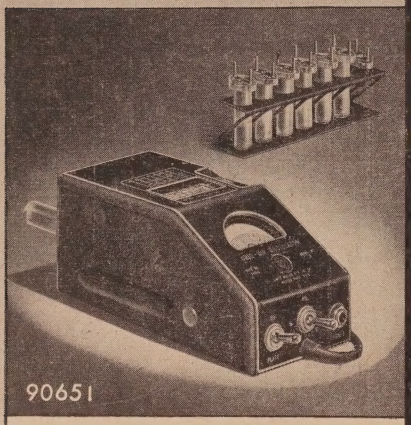
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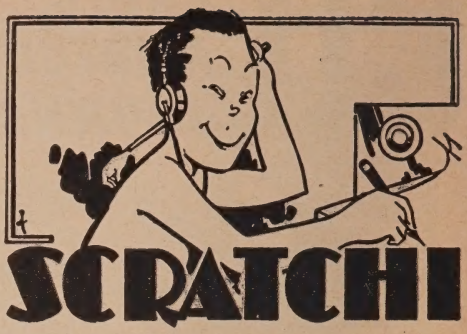
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Feenix, Ariz.

Deer Hon. Ed:

This is a mere shadow riting you. I are not even Scratchi—just a number. In fackly, not even knowing what number I being, as stoopid chiefs of police who running this callaboose are holding me incommunication or some such things. And the food in the jale—Oh, my aching Hon. Back, it are piteous. Of course, you can telling the soup from the dishwater. It very easy, on acct. the dishwater is thicker and tastes better.

Having you ever been in Feenix in the summer? Of natchurally, if you having been, you undoubtless have been residing at some cosy guest ranch, with swimming suit on, keeping cool by sipping large glassfuls of cacktus jooce. No, I meaning have you ever been incarcerated in local jalehouse in the summer? My advice is . . . don't. It so hot here that I taking daily bread ration and making toast out of it just by holding it against the bars of my cell. No kidding, Hon. Ed!

Speaking of being hot, that are what starting Scratchi on the road to being in present predickament. It are cupple days ago. I had been getting hotter and hotter at home one evening, so finally deciding to take ride in my car to cool off a bit. As I are driving around I coming to drive-in theatre, so deciding to see the movie. Natchurally I not paying to get in, as having discovered some side roads where can sneaking in and still seeing and heering picture. I've only been caught once or twice, and are still a little sore at owner of drive-in theatre, but deciding to watch picture this night anyway.

I driving up side road, parking car where I can see the movie, then getting extra-long length of twisted pair from trunk of car, ducking through fence, hooking it to spare drive-in speaker, bringing lead back to car, and hooking it to speaker in car. Pretty slicky stunt—now I not only seeing movie but heering it too. Ten minutes later are wishing I hadn't bothered at all, although it are nice and cool with breeze coming through car window. Reason I wishing I stayed home is that the picture is one of those mushy love story things, which Scratchi can't standing.

Are getting so bored that I finally turning on filaments of mobile rig, and listening across band on receiver. Heering a few locals on, so deciding to call seek-you. Are no sooner pressing push-to-talk switch than horribul sound coming from speaker. Feedback! Somehow or other, the mobile rig are causing feedback to drive-in movie sound system. Hot

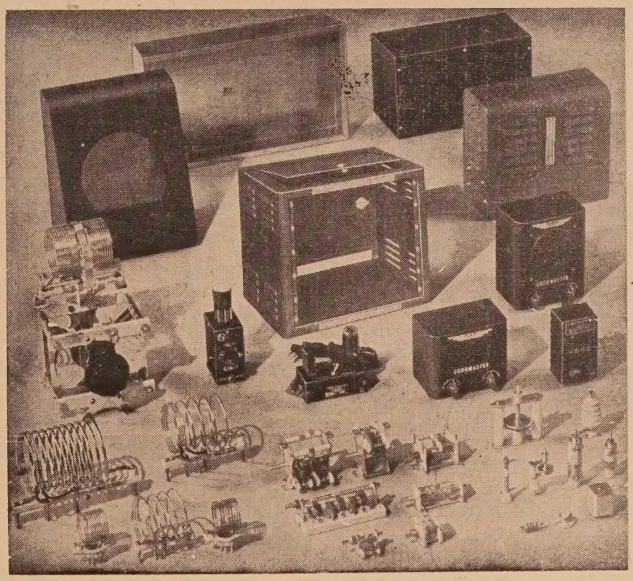
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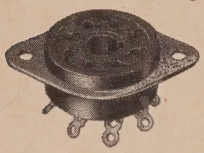
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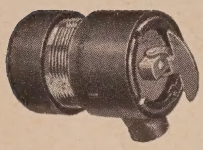
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for Better Performance–

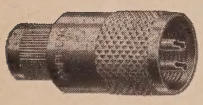
RF CABLES made by Amphenol are the product of continuous research and development by Amphenol's expert staff of engineers. These low-loss cables are designed to give top performance under all conditions! Rigid production control and inspection assure that they will perform as specified.



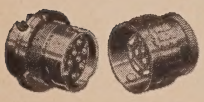
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Broad Band . . .

"Special Mobile Issue"

Editor, CQ:
The May issue of CQ was a "super-duper." While I am not a mobile fan, I did enjoy every article. . .

Ted Dell, KH6MS

Makema, Maui. T. H.

Editor, CQ:
Just finished leafing through the May issue of your magazine, and I read where you wanted the readers' opinion of an all-mobile issue. I couldn't resist writing you. You sure have done a grand job, and I would like to see more of the same.

Richard Finch, W3RKT

Pittsburgh, Pa.

Editor, CQ:
Fine business on the mobile issue. I'll cast my vote for more of these special issues.

B. H. Sams, W7PIE

Seattle, Washington

Editor, CQ:
In regard to your editorial in the May 1952 issue, please record my vote as 100% against further "Special Issues." For one, I'd buy only those issues dealing with my own particular specialty.

C. L. Wood, W2VMX/1

West Hartford, Conn.

Editor, CQ:
My sincere congratulations on your May issue. It's the finest yet, and I've taken the magazine from its very first issue.
Since every ham uses and is interested in antennas, may I suggest a "bang-up" issue on antennas, feedlines, masts, parasitic arrays, etc., etc.

Russell F. Hardy, W8AQT

Dayton, Ohio

Editor, CQ:
You asked for this! Your mobile issue was useless to me. When I saw, "Sorry! No prediction tables this month. Had to make room for mobile material," I hit the ceiling, they are the only thing I really take your magazine for.

Roger D. Mace, W6RW

Los Angeles, California

Editor, CQ:
O. K. on the May issue and it will certainly serve as a mobile handbook.
Like the idea suggested about "Special Issues." Perhaps one could be made on antennas giving the dope and especially how and why of matching in the case of using two Yagis to be fed with co-ax.

C. A. Haas, W2HIA

Perth Amboy, N. J.

Editor, CQ:
Just received the May issue of CQ. Brother, that one issue alone really amounts to a handbook! Congratulations on the work you are doing. Sure glad my subscription is paid up as I would hate to risk loosing any single issue.

D. E. Chapman, W9DPY

Lombard, Illinois

Thanks for a very compact and comprehensive treatment of mobile operation as set forth in the May issue of your magazine. . . . as a reader and as a ham I would like to see more "Special Issues."

Leslie C. McCall, WØVVO

St. Louis, Missouri

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59 MYRTLE AVE., BROOKLYN, N. Y.

Editor, CQ:

You did a bang-up job on the Special Mobile Issue. The best I ever saw. You've started going places (again?), keep it up.

Bryan Lamb, WØDYT

Hubbell, Nebraska

Editor, CQ:

I like the idea of special issues. I like a nice fat issue of CQ with everything pertaining to amateur radio.

Agathon Albion, W2UMS

Lewiston, New York

Editor, CQ:

Although I am not particularly interested in mobile transmission, I enjoyed the entire May issue. Nothing like being up to date, theoretically.

Lewis J. Friedman, W2IO

New York

Editor, CQ:

The May issue of CQ arrived in the mail yesterday morning, and I thought you might be interested in this one ham's appraisal of this special mobile issue.

Of course, I stayed up half the night reading it from cover to cover, so I'm a bit sleepy today but I can still see enough to type a few sentences to let you know that I consider this issue a "classic."

Earl M. Perry, W9BVW

Chicago, Illinois

Editor, CQ:

I have just gone through this month's CQ from cover to cover and believe me, it was well worth the money I paid for it. Although I have not gone mobile as yet, expect to do so, and will find this month's CQ invaluable to me.

Robert W. Flynn, WN6GPH

Los Angeles, California

Editor, CQ:

. . . I would have been equally disgusted to find it devoted to RTTY, AM, FM, PM, TV, CW, FSK, net operation, shop practice, operating procedure, vacuum tube keyers, or the sex life of the brontosaurus. . . it's sort of like shooting a June-bug with a 10-gauge shotgun at 30 paces. You can't see the bug, but there's a chance you'll hit it.

George Thurston, W4MLE

Harrisonburg, Va.

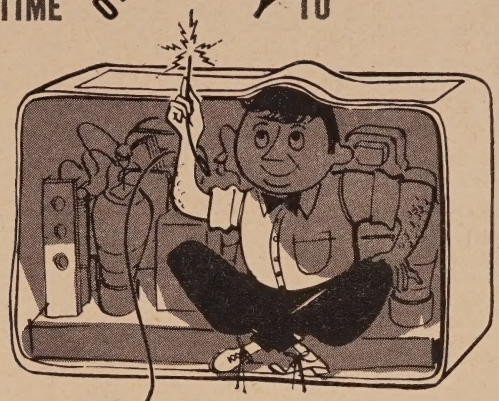
Don't Forget Your Address

The average day brings at least a dozen pieces of mail that must be answered and handled personally by the Managing Editor. Many of these letters deal with amateur radio both in the past and in the future. Of particular importance are the manuscripts which are received from amateurs in the field. It is these unsolicited manuscripts which form the backbone of the exceptional material that can be presented in CQ.

It is very disturbing to find that a number of manuscripts, etc. are received from authors who do not supply their correct or latest mailing address. At the present time there are several manuscripts at hand which have been returned by the post office department as being "undeliverable." In particular we would like to note the one received last November from W7GWA entitled, "News From Slippery Creek." The post office claims that W7GWA "moved and left no forwarding address."

Don't forget—if writing the CQ staff, for either editorial reasons or for problems relating to your subscription—always include your latest and correct mailing address.

A ONCE-IN-A-LIFETIME OPPORTUNITY TO



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Although you are probably employed as an engineer in the electronics industry right now, how often have you said, when dreaming up a hot new circuit for your rig, "Boy, I wish I could make ham radio my job!"

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Write and tell us about yourself — where you went to school, what you've been doing, what you'd like to do — and, of course, include the usual details of age, marital status, present salary, etc. We'll give you a definite decision just as soon as possible.

President, National Company, Inc.

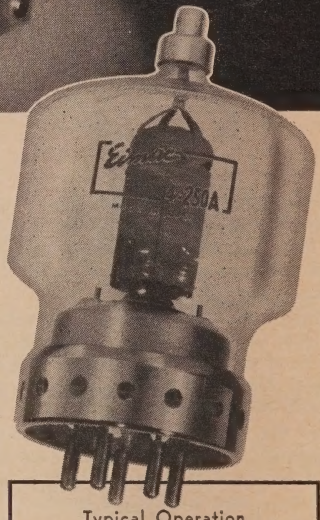
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Information about the 4-250A can be obtained from your Eimac dealer.

Typical Operation
(frequencies below 75 mc.)
Radio Frequency Power Amplifier and Oscillator Class-C FM or Telegraphy (key down conditions one tube).

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D-C Screen Voltage	500 volts
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D-C Plate Current	345 ma.
Plate Power Input	1035 watts
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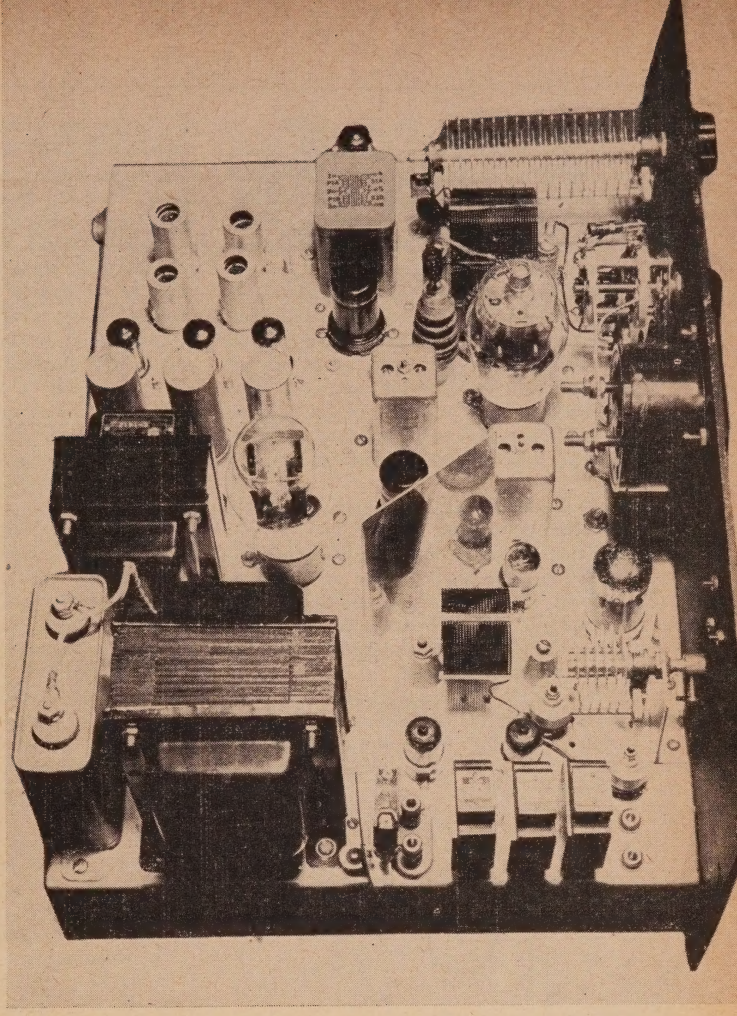
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At the lower right can be seen the oscillators with the 6C4 tubes just above the crystals. Directly above the VFO coil is the 6BE6 mixer with the keyer tube towards the front panel. The 807 final amplifier is plainly visible. Audio, power supply and VR tubes to the rear of the chassis.

The "MODERN"– A Heterodyne Exciter

DON M. WHERRY, W6EUM*

The author doesn't claim that this exciter will do everything in the shack but sweep the floor. Naturally, no one would want anything like that. On the other hand, the author has reduced his various circuit ideas to bare essentials as viewed by present-day operating standards and requirements. See if you don't find something of use in this exciter. —Editor

Here is an exciter or low power transmitter that has almost everything you can possibly use, all in one compact unit. You may not want to duplicate the complete exciter, but you may wish to incorporate some of the rather novel features in your next rig. For CW men there is break-in operation and soft, chirpless keying. Phone men have voice operated break-in, filtered audio for more punch, and a choice of either AM or FM. Both groups will like the frequency stability, the ease of direct calibration with almost any desired bandspread, the Pi network output tuner which will load almost anything, and the healthy power output which will easily drive a half kilowatt triode or a kilowatt pentode.

Oscillators

The principle objection to the use of break-in with CW is that an oscillator cannot be readily

*Box 306 Camarillo, Calif.

keyed and still produce soft, chirpless signals. In order to meet this problem, as well as some others, the circuit in *Figure 1* was developed. You will notice that there are actually two oscillators, one crystal controlled, and the other variable. When these two are mixed in the following stage the resultant is the actual output of the VFO.

The crystal oscillator uses the standard Pierce circuit with a 9 mc crystal. This crystal is used when the exciter is to be VFO controlled. A five position switch (*S1*) also allows the selection of any of four other crystals in the 3.5-4 mc range for fixed frequency operation. The Pierce circuit was selected because it requires a minimum of parts, provides stable operation, and will work with almost any crystal.

The variable oscillator uses the remarkably stable Clapp circuit and covers the 5 to 5.5 mc range.

A combination of series and parallel trimmers are used in the variable oscillator for band setting, allowing both the high and the low end of the band to be set exactly or, of even more importance to the CW man, any portion of the band to be expanded to give full dial coverage.

The exciter output frequency is the difference between the 9 mc crystal oscillator and the 5 to 5.5 mc variable oscillator: 3.5 to 4 mc. These two oscillator frequencies were chosen primarily because of the availability of 9 mc crystals. Considerable latitude is permissible in the choice of these frequencies if two important considerations are taken into account: 1) They should be of such a value as to have no harmonics in the lower frequency amateur bands. 2) They should be higher than the mixed frequency in order to avoid direct harmonics riding through the mixer. If your receiver has poor image rejection you should also consider the possibility that the oscillators might interfere on image frequencies. Little trouble should be encountered since the oscillators are run at very low power and the unit is well shielded in a metal cabinet.

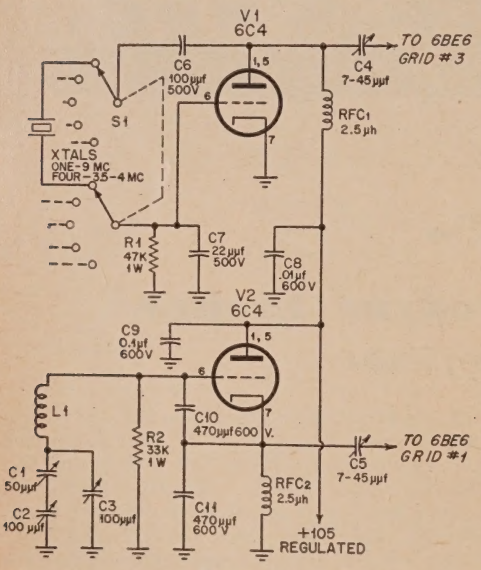


Figure 1

R1—47,000 ohm, 1 W
R2—33,000 ohm, 1W
C1—50 µµf variable (Bud type MC)
C2, C3—100 µµf variable (Hammarlund APC)
C4, C5—7 to 45 µµf ceramic trimmers
C6—100 µµf 500V mica
C8—.01 µf 600V paper
C10, C11—470 µµf 600 V mica
RFC1, RFC2—2.5 mh chokes (receiving type)
S1—Crystal switch, two wafer, 6 position

This approach to VFO design has several special advantages. Since neither of the oscillators are on the operating frequency it is quite feasible to let them run continuously. This greatly improves the frequency stability of the VFO and eliminates the possibility of any chirp in the signal. Only when the mixer stage is keyed will there be any output on the operating frequency. Thus you have break-in operation on your own frequency without elaborate shielding of the oscillator. If only the lower hundred kilocycles of the 7 mc band are of interest, for instance, it is simple to adjust the trimmers so that the VFO dial will just cover that range with full dial movement. Obviously, the one difficulty with this system is that the dial calibration is not linear.

The main tuning condenser is *C1* while *C2* and *C3* are air trimmers. To set the calibration set *C1* to maximum and adjust *C3* for 5 mc output of the variable oscillator or for 4 mc output at the mixed frequency. Next set *C1* to minimum and adjust *C2* for 5.5 mc output of the variable oscillator or 3.5 mc output at the mixed frequency. It will be necessary to juggle back and forth a few times since the two adjustments interlock.

The shielding of the two oscillators is up to you. It is not of great importance under normal conditions. In this exciter they are shielded from the magnetic field of the power transformer by a baffle.

Condensers *C4* and *C5* are small ceramic trimmers which are used to provide the minimum injection voltage to the mixer necessary for adequate output from the stage. They may, if trimmers are in short supply, be substituted by a fixed capacity of 30 µµf (approximately). The trimmers are preferred because too heavy coupling will not only overload the mixer, but will "pull" the Clapp oscillator when the mixer is keyed, destroying one of the prime advantages of non-oscillator keying.

Mixer

The mixer and associated circuits are shown in *Fig. 2*. In wiring the 6BE6 mixer be sure to connect the grid leaks from grid #1 (VFO injection) and grid #3 (crystal injection) to the cathode and not to ground as the keyer tube will put a large bias on the mixer grid otherwise.

The switch *S2* is used for spotting the frequency in the receiver. Choose a value for *R6* that will give a weak signal on the highest frequency band to be used.

Break-In Circuits

Any convenient tube having a low plate resistance may be substituted for the 7C5 keyer tube. The

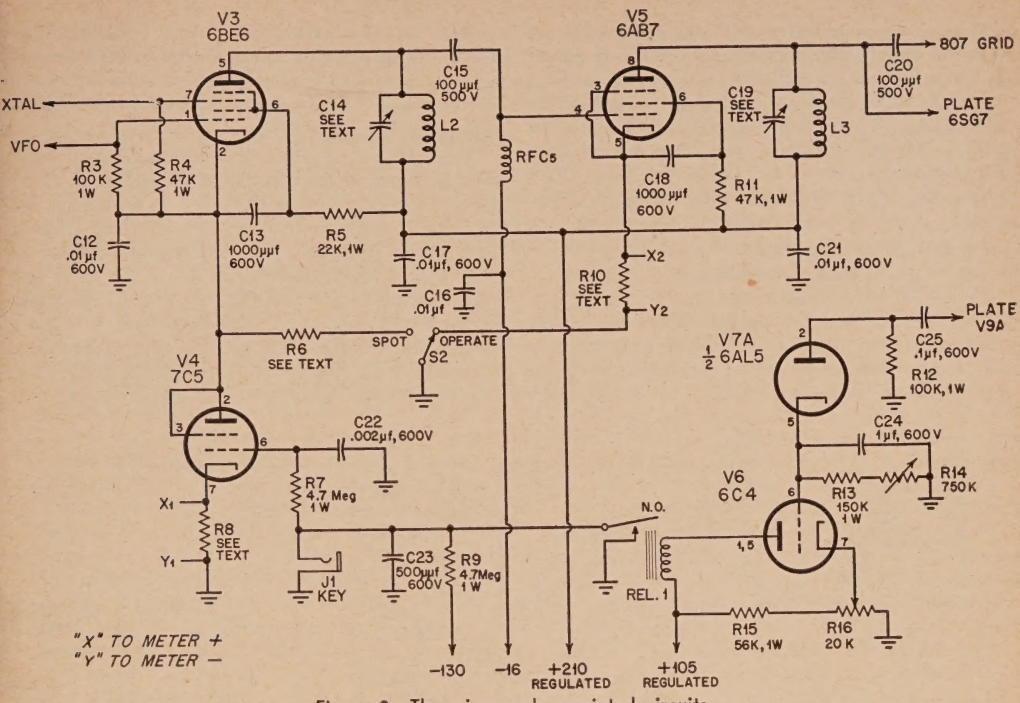


Figure 2. The mixer and associated circuits.

6AS7 is fine electrically, but it is high priced, has an over size envelope, and terrific filament demands.

The phone break-in circuit utilizes a 6C4 with a 10,000 ohm relay as its plate load. The normally open contacts are wired in parallel with the keying jack. At *rest* (no modulation) the plate current is cut off due to the positive bias applied to the cathode by the setting of *R16;* this allows the relay to open. As speech starts, the grid is driven positive, causing the plate relay to close, thereby turning on the transmitter. The upper limit of the grid voltage (rectified a.f. from the audio system) is held to a nearly constant value regardless of the speech amplitude by the limiting action of the grid which, when swung positive by the rectified a.f. draws current and levels off the positive peaks. This is easy to understand when it is considered that the grid-cathode impedance of the tube drops to approximately 1000 ohms with positive bias. This limiting action means that the time delay between the end of the speech signal and the opening of the relay is independent of the loudness of the last spoken word or sound. The delay is just as long for a shout as for a slight sigh.

There are several ways to connect the a.f. rectifier tube (6AL5), however, this particular circuit was chosen because it presents a lighter load to the audio tube (½-6J6, *V9A*).

The initial adjustment of the break-in circuit is simple and should seldom need attention. With everything turned on and no speech input, set *R16* at the point where the plate relay just drops out. Next adjust the delay potentiometer (*R14*) for the desired time delay. That's all.

R3, R12—100000 ohm, 1W
R4, R11—47000 ohm, 1W
R5—22000 ohm, 1W
R6—Adjust for VFO set (see text)
R7, R9—4.7 megohm, 1W
R8, R10—Meter shunt (see text)
R13—150000 ohm, 1W
R14—750000 ohm potentiometer (Centralab)
R15—56000 ohm, 1W
R16—20000 ohm potentiometer (Mallory 4 watt, type A20MP)
C12, C16, C17, C21—0.01 µf, 600V paper
C13, C18—1000 µµf, 600V mica
C14—Trimmer in i.f. can (see text)
C15, C20—100 µµf, 500 V mica
C19—Trimmer in i.f. can (see text)
C22—2000 µµf, 600V mica
C23—500 µµf, 600V mica
C24—1 µf, 600V paper
RFC5—2.5 mh (Rec. type)
S2—Toggle S.P.D.T.
J1—Key jack (Phone jack)
Rel 1—10000 ohm relay (RBM 71-5131P2)
L2, L3—See coil table

Audio

The cathode current of the 6AK5 audio tube (see *Fig. 3*) is used to provide mike voltage for a carbon mike input. The audio is filtered from the cathode circuit by the 40 µf condenser. If you do not wish to use a carbon mike the usual crystal mike input can be utilized and the transformer omitted. The output of the 6AK5 drives both sections of the 6J6, one section (*V9A*) furnishing power for the phone break-in tube, and the other feeding the AM and FM modulators. Since the

grid of the break-in section is driven positive during modulation a 56,000 ohm resistor *(R30)* is placed in series to prevent the tube from unduly loading the 6AK5. The output of this stage is rectified by one-half of the 6AL5 *(V7A)* and applied to the grid of the 6C4 break-in tube already described. The audio from the second half of the 6J6 *(V9B)* passes through a low pass filter, narrowing the width of the speech channel, and driving the 6SG7 FM modulator and the 6AQ5 AM modulator.

Phase Modulator

The 6AB7 *(V5)* needs little comment as it is a standard phase modulated stage. Fixed bias is applied to the grid allowing the cathode to be grounded (through the meter shunt resistor). Both the buffer and the mixer plate coils (*L2* and *L3*) are wound on i.f. transformer forms (old windings removed) using one trimmer for the tank condenser. They are wound to resonate in the 3.5 mc band. This method is simple and provides adequate shielding for a low level stage.

The 6SG7 *(V10)* is a reactance tube modulator operating across the plate tank of the 6AB7 *(V5)* buffer tube. Care should be used in advancing the gain control for there is enough audio to allow a very large deviation. One undesirable feature of this type of modulator is that the buffer tank, and all following stages, must be tuned to the operating frequency. If this is not done there will be quite a large component of AM present. This "defect" is common to all FM systems and should cause little concern. If the modulated, or de-tuned stage, is

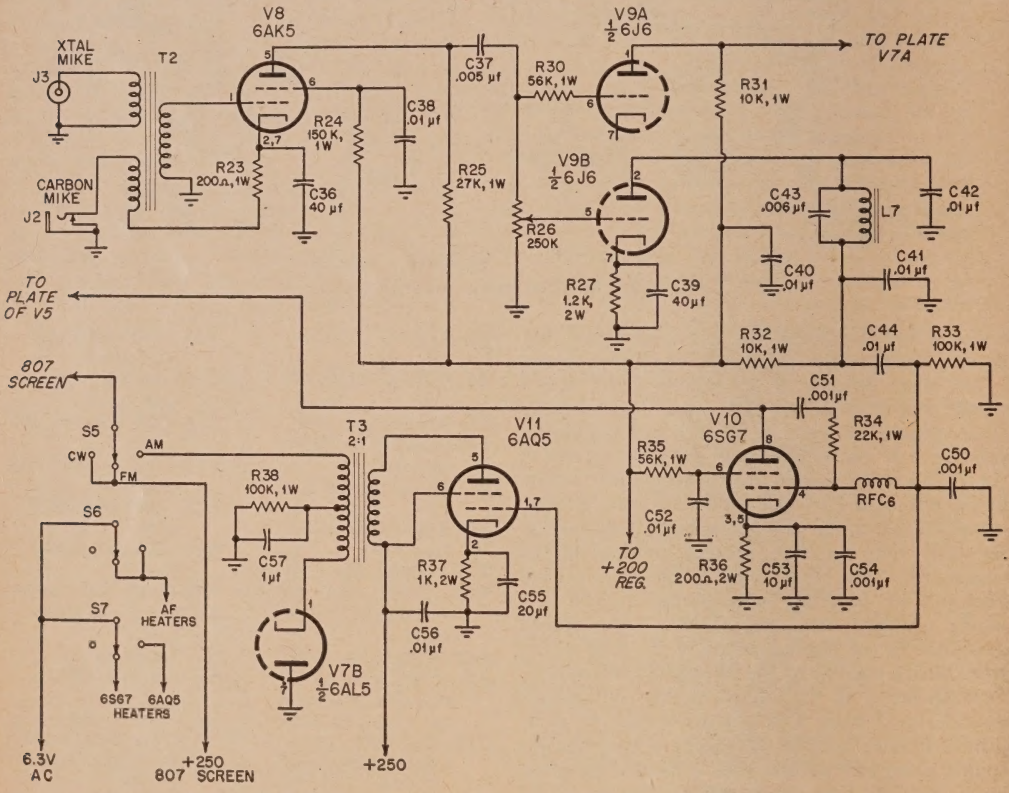


Figure 3. The audio and associated stages.

R23—200 ohm, 1W
R24—150,000 ohm, 1W
R25—27,000 ohm, 1W
R26—250,000 ohm potentiometer (centralab)
R27—1200 ohm, 2W
R30, R35—56000 ohm, 1W
R31, R32—10000 ohm, 1W
R33, R38—100000 ohm, 1W
R36—200 ohm, 2W
R37—1000 ohm, 2W
C36, C39—40 μf, 25V electrolytic
C37—5000 μμf, 600V mica
C38, C40, C44, C52, C56—0.01 μf, 600V paper
C41, C42—10000 μμf, 600V mica
C43—6000 μμf, 600V mica
C50, C51, C54—1000 μμf, 600V mica
C53—10 μf, 50V electrolytic
C55—20 μf, 50V electrolytic
C57—1 μf, 600V paper
RFC6—2.5 mh, (Rec. type)
L7—Choke, 0.25 henry (Millen 34400-250)
S5, S6, S7—Function Sw., 3 pole, 3 position
J2—Carbon mike jack (Mallory 702) shorting type
J3—Crystal mike jack (Amphenol)
T2—Mike transformer (Peerless A4282)
T3—Driver transformer (Stancor A4405)

followed by one or two more stages of class "C" amplification which are correctly tuned, the AM will be quite effectively ironed out.

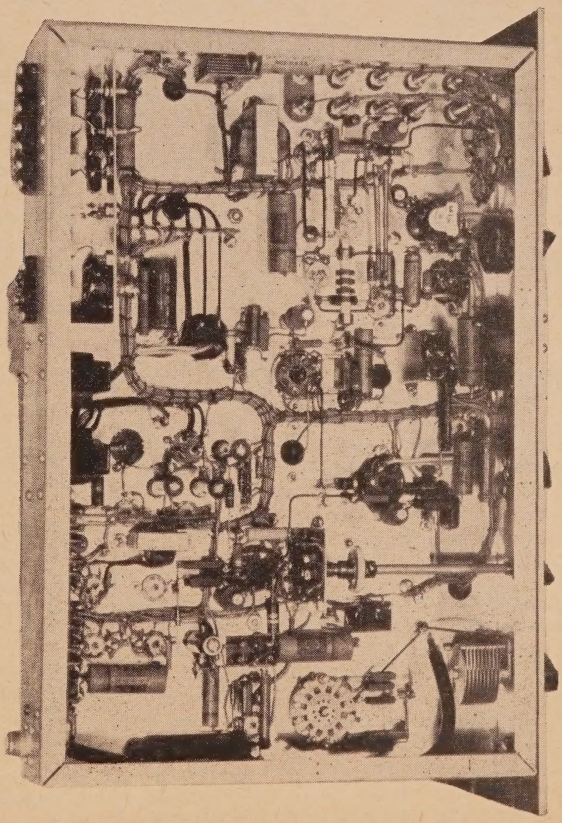
RF Output Stage and Amplitude Modulator

The output stage uses a 807 *(V16)* with capacity coupling from the buffer with fixed bias. Since self-oscillation is frequently a problem with 807's several precautions were taken to eliminate such tendencies. The screen 50 ohm resistor *R20,* is connected directly to the screen socket terminal, the other end being bypassed to the cathode. A small choke *(L4)* of five to seven turns is wound around a two watt 100-ohm resistor and connected directly to the plate cap. If this doesn't do the job completely a shield can be added to the 807. (See *Fig. 4.*)

The tank circuit is the familiar Pi network of which too much cannot be said. It will match a wide range of impedances and literally load into the XYL's clothesline. When a low impedance line such as RG8/U is used the harmonic suppression is very good. For forty meter output there is a tap on the tank coil *(L5)*, thus *S5* causes the 807 to act as a doubler for this band. Shunt feeding is used so that there will be no d.c. voltage on the tuning condensers and tank coil. The meter can measure the grid current, screen current, or the total tube current.

The AM modulator is an application of the constant percentage modulation system and as such is well adapted to driving a high power class "B" linear amplifier. The 6AQ5 has as its plate load a coupling transformer with a turns ratio of two to one. Half of the secondary voltage is rectified by one section of the 6AL5 *(V7B)*, the voltage showing up across *R38* and the filtering condenser *C57*. This voltage raises the center tap of the secondary above ground an amount proportional to, and following, the speech level. Superimposed on this d.c. voltage is the audio component from the remaining half of the transformer secondary, the resultant voltage varying from about zero to twice the d.c. value. The peak d.c. voltage at the center tap should be adjusted to about 100 volts maximum with "loud" speech. Under test, with the gain control *fully* advanced, there was 175 volts, this caused distortion since the 807 is not even close to linear through such a wide range of screen voltage.

This system of AM deserves much greater popularity than it now enjoys for it has several characteristics that are quite advantageous. For example there is high percentage of modulation at any audio level, that is, the r.f. energy radiated is just sufficient to accommodate any given level of audio. This results in greater intelligibility at low signal levels and a decrease in interference from heterodynes. It also, as mentioned, makes the use of class B linear



The entire exciter is built on a standard Bud 13x17x13 inch aluminum chassis. The TVI filters are in the upper left-hand corner. The wiring has all been carefully cabled. All r.f. wiring is made of #12 solid enameled.

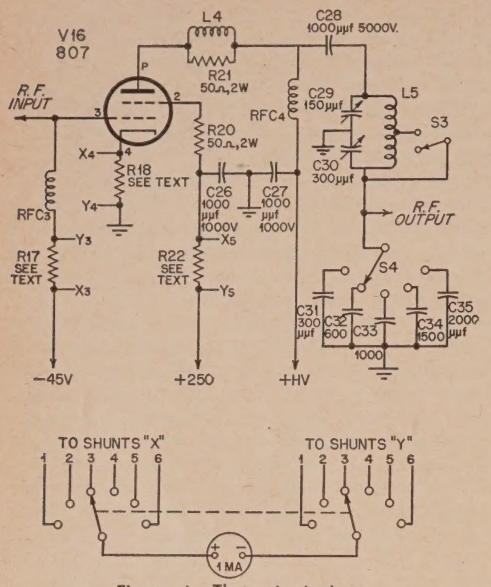


Figure 4. The output stage.

R17, R18, R22—Meter shunt (see text)
R20, R21—50 ohm, 2W
C26, C27, C33—1000 μμf, 1000V mica
C28—1000 μμf, 5000V mica
C29—150 μμf, variable (Bud #1535)
C30—300 μμf, variable (Bud #910)
C31—300 μμf, 1000V mica
C32—600 μμf, 1000V mica
C34—1500 μμf, 1000V mica
C35—2000 μμf, 600V mica
RFC3—2.5 mh choke (Receiving type)
RFC4—Transmitting type (5 pin surplus)
S3—Band Sw., single gang, two position (Mallory 172C) Ceramic
S4—Antenna loading Sw., (Mallory 172C) Ceramic
S8—Meter Sw., two pole, six position
L4, L5— See coil table

amplifiers more practicable. This system is preferable to the clamp tube modulation system which does not have the "constant percentage" feature. Admittedly, many operators have achieved this feature with the clamp tube system, but only by misadjusting the clamper bias and thereby cutting the negative peaks of the speech envelope badly, a procedure that has little to recommend it.

Power Supply

The a.c. power lines are filtered for TVI suppression with *L8, L9,* and the associated condensers. Contracts *A* & *B* on the terminal strip are the main a.c. line connections. Terminal *C* furnishes a.c. to any other equipment that you want to turn on and off with the main power switch, *S9,* or makes it possible to turn on the exciter with an external switch connected across terminals *B* & *C*. *S10,* the "Standby" switch, is brought out to terminal *D* for remote control. The high voltage for the 807 goes through the jumper on the terminal strip from *F* to *G*. In this way it is simple to use an external power supply for the 807 plate should higher power be desired from the output stage.

A small filament transformer (*T4*) is used to provide 110 volts to the selenium bias supply. Resistor *R50* (33 ohms) acts both as a fuse in case of a short in the bias supply and as a peak current limiting resistor for the rectifier, preventing it from being damaged. The final adjustments of the 807 bias voltage (-45V) may be made either by varying the *R39-40-41* network, or by changing the capacity of *C62* (more capacity to increase the bias, less to decrease bias).

Voltage regulation is used for the oscillators, phone break-in, audio, mixer, and buffer stages. Variables *R47* and *R49* should be adjusted for 3/4 volt drop across the resistors.

Meter Multipliers

No values are given for the meter shunts *(R8-10-17-18-22)* or the series resistors *(R42+43)*. These values will depend upon the meter you use and may be found with the following formulas:

$$\text{SHUNT} \quad R_s = \frac{R_m}{(n-1)}$$

R_s—Shunt or Series Resistor Required
R_m—Meter Resistance
n—Scale Multiplication Factor

$$\text{SERIES} \quad R_s = R_m\ (n-1)$$

In case the meter resistance is not known it can be computed by connecting a small battery, the meter, and a potentiometer in series and adjusting the potentiometer for full scale deflection of the meter. Then, without touching anything, connect another potentiometer in parallel with the meter and adjust it for one-half scale deflection of the meter. The resistance of this potentiometer is equal to the resistance of the meter and may be read with an ohmmeter. Putting an ohmmeter across the

COIL DATA

L1—Bud 80 meter 75 watt plug in with link and 7 turns removed. Base removed and mounted on standoffs.
L2, L3—Mixer and buffer plate coils made from i.f. transformer forms. Remove the i.f. windings and wind with 75 turns of no. 28 enameled. (see text)
L4—UHF choke, 6 turns no. 20 enameled around R21.
L5—Bud 80 meter 75 watt plug in with link and base removed and mounted on standoff insulators. Tap 14 turns from plate end for 40 meter tap.
L8, L9, L10, L11, L12—UHF choke, 37 turns no. 20 enameled on 3/8" form, winding 1.5" long.
Note—Due to the small diameter of the coil the turns will vary widely with the parts and wiring placement. Some "cut and try" will probably be necessary.

meter does not give the actual meter resistance since there is usually a built-in shunt resistor in the meter.

The scale multiplication factor (n) can best be explained by using an example. If you have a 0-10 ma. meter and want it to read 0-20 ma. The value of "n" would be $\frac{20}{10}$, or 2. You are multiplying the scale by 2.

In this exciter a 0-1 ma meter was used shunted to read 50 ma on the mixer and buffer plates, 5 ma on the final grid, 250 ma on the final plate, 50 ma on the final screen, and 1000 volts on the high voltage.

Other Notes

Care should be taken not to overdrive the mixer stage for a very small input from the two oscillators is sufficient for good mixing. The resultant output of the mixer is small and will be hard to detect with anything but a very sensitive r.f. indicating device. The 807 grid current may be used for peaking both the mixer and buffer stages. When using FM be careful not to turn up the gain control very high for extreme deviation is possible. When calibrating the VFO it is well to remember that as the tuning condenser closes the output of the mixer increases in frequency. This reversal of normal VFO operation results from the using of the difference between the two oscillators.

For good appearance of the finished equipment it is well to put all wiring, resistors, and condensers in only one of the three directions; up and down, right and left, and fore and aft. The extra time spent in doing this will be well rewarded by the enhanced finished product. The d.c. wiring should be grouped and cabled. The r.f. wiring should be in the clear as much as possible, but try to keep it in one of the

(Continued on page 63)

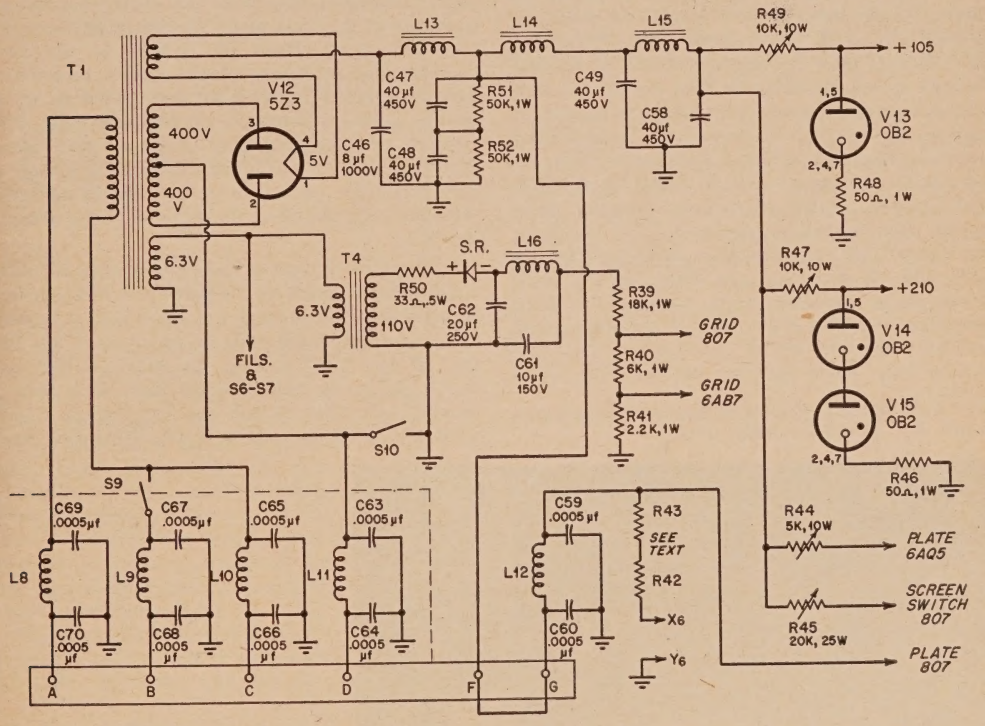


Figure 5. The power supply.

R39—18000 ohm, 1W
R40—6000 ohm, 1W
R41—2200 ohm, 1W
R42, R43—Meter series resistor (see text)
R44—5000 ohm, 10W adjustable (Ohmite Dividohm)
R45—20000 ohm, 25W adjustable (Ohmite Dividohm)
R46, R48—50 ohm, 1W
R47, R49—10000 ohm, 10W adjustable (Ohmite Dividohm)
R50—33 ohm, ½W
R51, R52—50000 ohm, 1W
C46—8 µf, 1000V paper (CD Dykanol)
C47, C48, C49, C58—40 µf, 450V electrolytics (Dual 40—CD's)
C59, C60, C63, C64, C65, C66, C67, C68, C69, C70—500 µµf, 600 V mica
C61—10 µf, 150V electrolytic
C62—20 µf, 250V electrolytic
S9, S10—S.P.S.T. toggle
L13—Choke (Stancor C1412)
L14, L15—Choke (Stancor C1710)
L16—Choke (Stancor C1707)
T1—Power transformer, 400-0-400 at 200 ma; 5V at 4A; 6.3V at 5.5A (Stancor P6165)
T4—Filament transformer, 6.3V at 1.2A, (Stancor P6134)
Selenium rectifier—Grid bias, 65 ma (Federal 1002)

A One-Element Vacuum Tube Transmitter

PHILIP S. RAND, W1DBM*

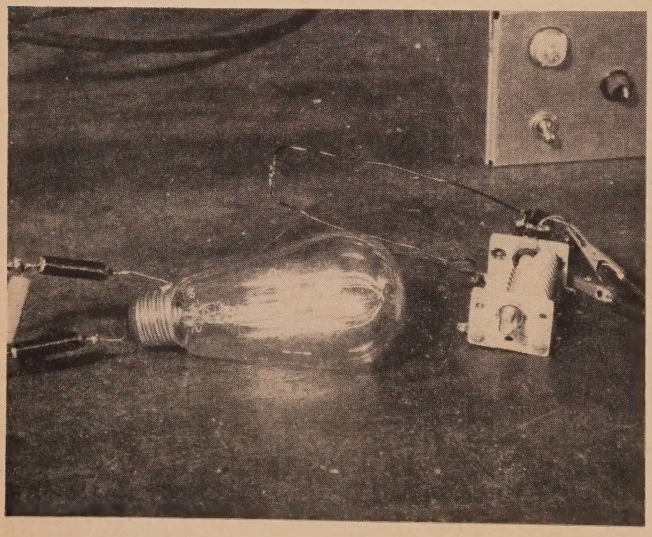
Maybe you are one of those honest and hard working hams that believes TVI is due to our advanced knowledge of circuitry and design. If you are, then read this carefully, because the situation is not that way at all. As a matter of fact the author goes on to show that we have cause to sit back and wonder about many things.—Editor.

This Spring I had the pleasure of attending the Dayton Ham-Vention and heard Al Gunston, W8GQ, discuss his experiments with a "vacuumless" vacuum tube. It seems, according to Al, that the tube manufacturers have been pulling the wool over our eyes for years by putting a vacuum in vacuum tubes solely to prevent us from making them ourselves out of a few odds and ends in the junk box. Al demonstrated this fact conclusively with a one vacuumless tube crystal controlled transmitter. The vacuumless tube used a 110 volt heating element for the filament, a cake grid for the grid, and an aluminum pie plate for the plate. These three elements were supported in their proper relationship right out in the atmosphere and when the tank circuit was tuned to resonance a neon bulb would light on the pie plate and a strong signal was received on a receiver about 50 feet away. The oscillation stopped when the crystal was removed.

This amazing demonstration started me thinking. Upon my return to Redding Ridge, Connecticut, I busied myself in my home laboratory conducting some basic research into the generation of radio frequencies. It gives me great pleasure to announce at this time that although radio amateurs may have been played for suckers by the tube manufacturers, the tube manufacturers themselves had the greatest hoax of all time pulled on them by the so called inventors of the radio tube. My research reveals that these inventors used more than one element simply so that they could get a new patent for each element and thereby increase their personal wealth at the expense of the general public.

In those early days of radio there were no radio engineering handbooks to refer to, and general knowledge on the subject was lacking so it is easy to see how this hoax could be put over. It was the case of the blind leading the blind. Hitler and Uncle Joe undoubtedly learned from them that if you tell a lie often enough and long enough it will eventually be considered a truth. Remember that

*c/o Laboratory of Advanced Research, Remington Rand, Inc., South Norwalk, Conn.



The one element vacuum tube undergoes extensive tests in the laboratory directed by W1DBM.

for thousands of years everybody thought the world was flat, while today the world knows it is round, or is it???

During my study of the literature on the subject, I came across a paper written by Drs. Barkhansen and Kurz in 1920 and published in *Phys. Zeits.*, Vol. 21 (describing a short wave oscillator). In 1922, Gill and Morell published a paper in the famous *Philosophical Magazine*, Vol. 44 showing a similar but improved version of this oscillator. This oscillator was known as an "Electron Oscillator" and utilized a triode vacuum tube. (These four learned gentlemen were also victims of the hoax.) *Fig. 1* shows the basic circuit for an "Electron Oscillator." Note that when a triode is used the grid is positive and the plate is slightly negative with respect to the cathode. Speaking of cathodes—they were invented to further the multi-element tube hoax by a lazy inventor who wanted time to smoke a cigarette after he turned his radio on and before he had to reach over and tune in the station. To get back to *Fig. 1*—the mechanism of operation is as follows:[1]

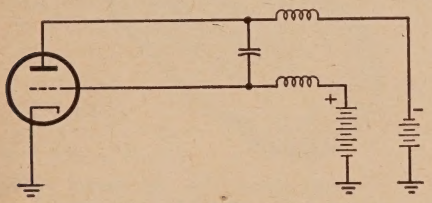


Fig. 1. The basic "electron oscillator" circuit.

The cathode being hot gives off electrons which are attracted to the positive grid.[2] The plate being negative does nothing and might as well be left out. Now the grid, being made of fine wires, is missed by most of the first electrons on the first trip so they circle around and make another pass at it, finally being collected. All these electrons gradually fall into a uniform pattern as they travel from the cathode to the grid and produce the electron oscillation. The frequency of this oscillation depends upon the geometry of the tube elements, the grid voltage, and the attached tuned circuit (to a small extent).[3]

Figure 2 shows how the circuit would look if we used a tube with only a filament and a grid with 120 volts on them. The idea of using 120 volts is that if you are going to make these tubes yourself it is much easier to obtain 120 volt tungsten filaments than any other kind. Furthermore it eliminates the need of a power transformer and a filament transformer. The actual mode of oscillation remains unchanged.

At this point the idea came to us that if we were going to do away with the tube manufacturer and the transformer manufacturer why not also get rid of the parts manufacturer? Why should we spend our hard earned cash on chokes, condensers and tuned circuits? Furthermore we still had to get rid of the grid in the tube. We decided to try to combine the filament grid and tuned circuit. *Fig. 3* shows our first attempt.

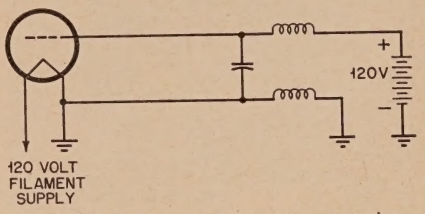


Fig. 2. Surprisingly enough you can get the same results from your "electron oscillator" by removing the plate of the tube and connecting up to the filament and the grid.

A little thought showed that we could use the same tungsten wire for both the grid and the filament because the only part that would emit electrons would be the negative end. This would act as the cathode while the positive end would not only keep its own electrons but would act as the grid and eventually collect those given off by the other end. In this way we would have maintained all the necessary conditions for our "electron oscillations." The long loop in the filament serves as the tuned circuit.

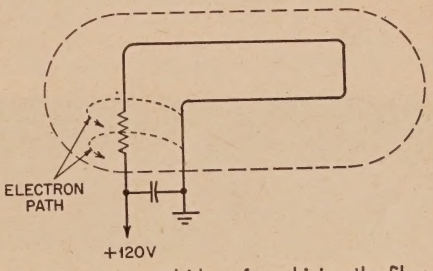


Fig. 3. An experimental idea of combining the filament and grid functions in one element.

In order to mount this long tungsten filament ruggedly and also to arrange it so that it would have the proper inductance, it was wound in a series of hairpins, 2 inches to a leg from a piece of fine tungsten wire salvaged from an old style electric light bulb. *Figure 4* shows this filament before being bent into a circle to fit into the glass envelope. Also shown in *Fig. 4* is the coaxial condenser used to tune the "filament" tank circuit to resonance. The calculated inductance of the special shaped "filament" coil being 0.3 μh, it was necessary to have about 35 $\mu\mu$f of capacity in this condenser in order to hit the 50 mc amateur band where we had decided to conduct our experiments.

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1. For a more detailed explanation see Page 521, First Edition of **Radio Engineers Handbook**, by Frederick Emmons Terman.
2. EDISON EFFECT—See Page 5, Second Edition of **Fundamentals of Vacuum Tubes**, by Austin V. Eastman.
3. The frequency is given approximately by:

$$\frac{E_g}{f^2} = \text{CONSTANT}$$

Where E_g is the grid potential, f—the frequency, and constant is a function of the tube geometry.
See Page 282 in the Second Edition of the **Radio Engineering Handbook**, by Keith Henney.

There is nothing critical about either the coil or condenser as the main thing controlling the frequency is the transit time of the electrons[3] in passing from the grounded end of the filament to the plus 120 volt end of the filament. In other words all you need to have to QSY is a heavy-duty potentiometer to vary the combined filament-grid voltage. Raise the voltage to raise the frequency and lower the voltage to lower the frequency.

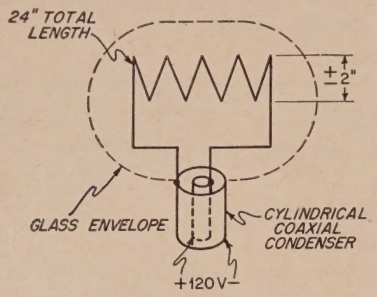


Fig. 4. Another experimental idea showing the coaxial "tuning" condenser used to bring the filament tank to resonance.

An experimental tube of the type shown in *Fig. 5* was tried very successfully. The grounded outside of the coaxial condenser was then threaded for convenience in mounting the tubes in standard light bulb sockets which are readily available in nickle and dime stores. In order to prove once and for all whether or not a vacuum is needed in a vacuum tube, this tube was first filled with ordinary air; next, with a pure inert gas and finally with nothing (an extremely good vacuum). With both the air and gas filled tubes strong oscillations were present as proved by instruments capable of measuring the radiated signal. This turned out to be a wavelength of from 4000 Angstroms to well over 7000 Angstroms. Measurements were made with both a thermometer and a photographic exposure meter. The trained research man will immediately see several applications for such a tube such as drying paint, use as a reading light, or even the infra-red cooking of hot dogs (one use demonstrated by Al Gunstron at Dayton). When the one element tube was tried with a vacuum the story was different. Strong oscillations were present near the 6-meter band. The frequency could be changed at will from about 56 mc to almost 90 mc simply by varying the voltage from 70 volts to 160 volts. Experimental data proves these to be the practical limits. Below 70 volts the filament gets too cold to give off enough electrons and over 160 volts the tungsten melts. To lower the frequency to 50 mc it is necessary to design a new filament structure so that the voltage, electron transit time, and physical geometry all combine to produce oscillations at that frequency.

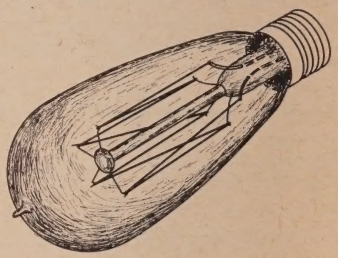
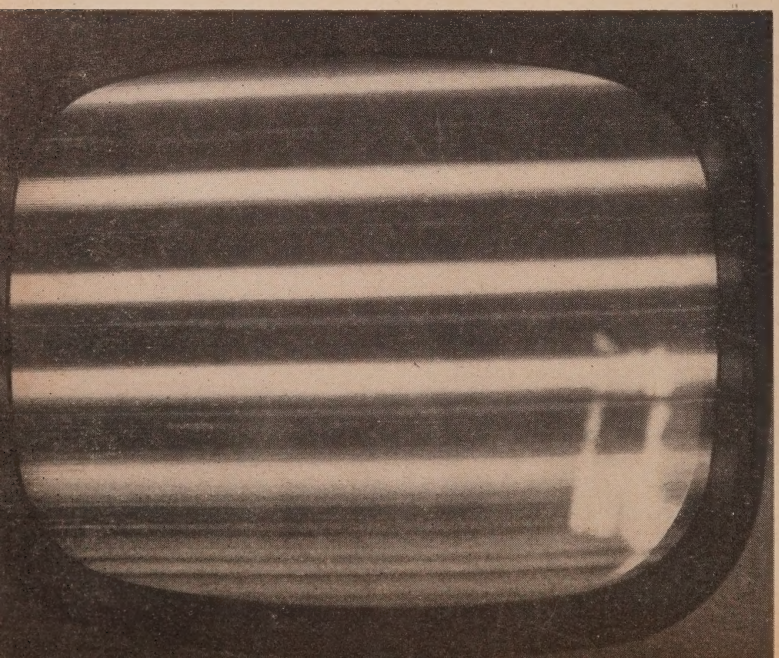


Fig. 5. The final product has the coaxial "tuning" condenser threaded for convenience.

Measurements were made by picking up the r.f. signal on a wavemeter tuned to 50-100 mc equipped with a 1N34 crystal diode and looking at the demodulated signal with an oscilloscope as shown in the photographs. See *Fig. 6.*

To prove that this was an electron type of os-



TVI caused by the one element wonder when operated on straight 120 volts D.C.

cillation, a small permanent magnet was held close to the filament. By rotating the magnet the intensity of the oscillation could be increased or decreased, in fact could be stopped completely, as the magnetic field upset the path of the electrons flowing from the cold end of the filament to the hot end across the vacuum. This phenomenon immediately suggested a simple cheap tubeless modulator, namely, a magnetic ear-phone driven by a carbon mike. In practice the ear-phone is merely placed near the one element vacuum tube transmitter so that electron stream is subjected to a magnetic field that is varying at audio frequencies. I have named this the "Rand System of Modulation."

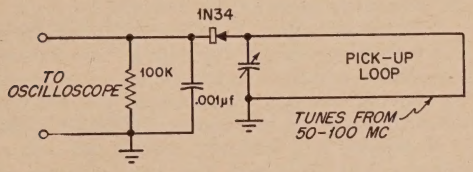
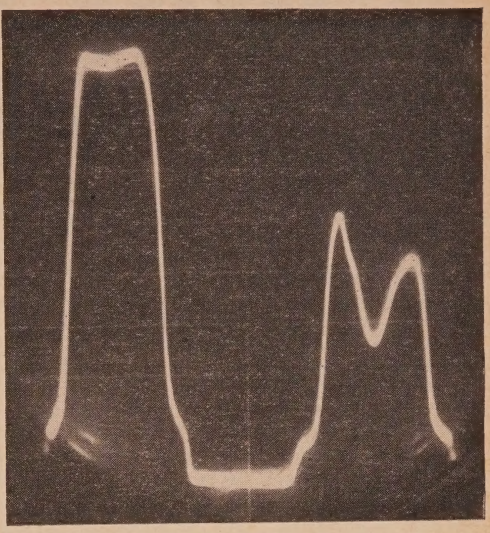


Fig. 6. A wavemeter circuit for detection of oscillations from the one element vacuum tube. This permits the demodulated wave to viewed directly on an oscilloscope.

NBFM is equally easy to apply simply by putting a microphone transformer in series with the 120 volts to the tube. As the mike varies the 120V at audio frequencies the r.f. output varies accordingly.

You have probably all guessed by now another use for this transmitter. By applying 120 volts a.c. at 60 cycles the rig becomes a cheap wide-band FM signal generator sweeping all the low TV channels.

When the FCC opens up the amateur bands for carrier shift keying this is just the rig to use. Connect the key across a small resistor in series



This is the oscilloscope pattern of the audio detected by the crystal circuit in Fig. 6. The transmitter was being operated with 120 volts at 60 cycles and was sweeping from 60 to 80 mc with an FM signal generator.

with the 120 volt input and when the key is closed the frequency will shift by the amount of the voltage change.

There are several more important uses for this new invention, but my straight jacket is too tight to write more at this time and furthermore it is rumored that tubes of this type are in wide use for lighting purposes and cause very bad TVI.[4] (Should think they would) ! ! !

4. See Pages 82, 86, and 87 in the Second Edition of **Television Interference**, by P. S. Rand.



TVI caused by the one element vacuum tube when operated on regular house voltage at 60 cycles.

A Noise Limiter for Everyone

WILLIAM S. GRENFELL, W4GF*

Part one of two parts

If this were the Proceedings of the I.R.E. instead of CQ we would open our remarks by stating, "This is a tutorial paper." Actually this is another of our mild doses of all-important theory. The author does a remarkable job in his treatment of one of our most essential circuits.—Editor.

In general, noise limiters were not incorporated in standard communications receivers until after World War II. As a result, many pre-war and most war surplus communications receivers lack this very useful circuit. Even the limiters in some of the post-war receivers are not all they could be and may be improved to a considerable extent by minor modifications. Last but not least, a noise limiter must invariably be added to the BC automobile receiver if it is used in mobile operation.

Articles describing the addition of noise limiters have appeared in various radio magazines in the past few years. Most of these articles were limited

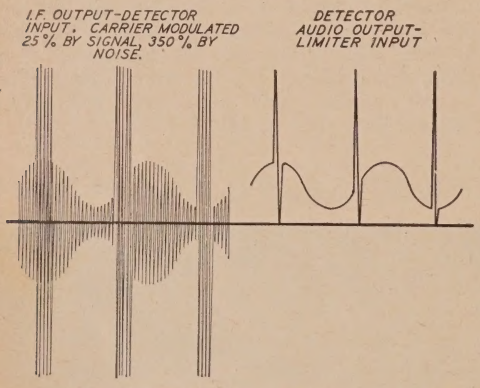


Fig. 1. A duration/amplitude comparison of noise pulse vs. desired signal modulation.

to instructions for adding a limiter to a particular make and model receiver.[1] Because the article was usually concerned with only one make of receiver, and in most cases omitted any discussion as to the actual electrical operation of the limiter circuit, many readers not familiar with the theory of limiter circuits were probably unable to adapt the circuit to general use.

Noise reduction circuits have been developed for application at any of several places in a receiver. Of all these circuits, one of the most effective and simple is the type employing one or two diodes (half or full wave) in series or shunt with the audio connection between the second detector and the first audio stage of the receiver.

The cost of adding a half-wave limiter circuit to a receiver amounts to the price of four resistors, a condenser, a diode, a socket and the on-off switch. The author strongly recommends the full-wave series circuit as the best choice of a limiter circuit. It is superior to a half-wave circuit and only requires a dual diode with two more resistors and one more condenser than a half-wave circuit. Physical lack of socket space for a dual diode should be the only reason for accepting the less effective half-wave circuits.

The Nature of Noise Interference

Understanding the way a simple diode limiter works requires a knowledge of the characteristics of the noise and its relation to the incoming signal. The most common types of noise plaguing the listener are the pulse types such as car ignition, atmospheric noises due to lightning and similar sources causing spark discharges. Compared to the length of a cycle at usual speech frequencies, the pulses of noise are usually of short duration and spaced widely apart (*see Fig.* 1). The reason that these pulses blank out so much of the signal, in spite of the fact that sometimes several cycles of the wanted signal may appear between pulses, is because the pulse amplitude is usually so much greater than the desired signal that when the pulse hits the receiver, the speaker or earphones vibrate much longer than the noise pulse duration. While the human ear is a wonderful device for separating a coherent signal from noise, it seems to have a built-in AVC system which automatically desensitizes itself from the noise. This action of the ear and the presentday electronical/acoustical reproducing devices fills in the gaps between pulses to such a degree that most, if not all, of the desired intelligence is lost.

The receiver i.f. amplifier will also lengthen the noise pulse duration[2]—the amount of "lengthening" being dependent on the bandwidth. High "Q" tuned circuits will "ring" or continue to oscillate beyond the actual duration of the pulse, a narrow band-

*3713 Kemper Rd., Arlington 6, Va.

1. An exception: "A Simple Noise Limiter," R. P. Haviland, Radio and Television News, Aug., 1950, p. 46.
2. "Comparison of Amplitude and Frequency Modulation," M. G. Nicholson, Wireless Engineer, July 1947, p. 197.

width causing greater "stretching" than a broad bandwidth. This action of the i.f. amplifier would indicate the desirability of applying noise limiting to the i.f. section of the receiver before the pulses can become "stretched." Some circuits have been devised for this very purpose. Fortunately most noise pulses still have sufficient space between individual pulses by the time they reach the second detector output to enable the more simple limiter circuits to do a good job. All that needs to be done to effectively limit the noise is to restrict the pulse amplitude to a level near that of the desired signal so that most of the intelligence between pulses can be recovered. While many methods of limiting

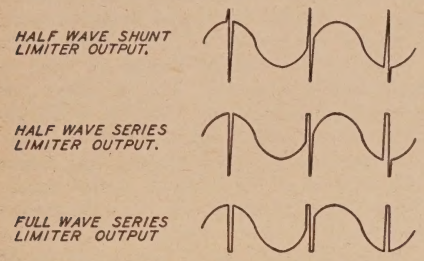


Fig. 2. The relative efficiency of the three basic noise limiter circuits.

noise have been devised[3,4] the three types of circuits discussed herein offer the most effective action for the least complicated circuitry. (See *Fig. 2*)

Simple Shunt Limiter

The way the simple diode limiter works on the noise is to act as a short circuit or an open circuit to the noise pulses without materially affecting the desired signal. Actually the short circuit type, usually known as a "shunt" limiter, is a diode in series with a d.c. bias connected in shunt across the audio output of the second detector of the receiver *(Fig. 3)*. The polarity of the diode and the bias is arranged so that the diode will not conduct until signal or noise voltages exceed the bias value. When the bias value is exceeded, the diode conducts and acts as a low resistance path or by-pass to ground for the excessive voltages. Thus, assuming a "perfect" diode, the amplitudes of all voltages passed on to the audio stage will be limited to a value no greater than the bias voltage. The usual diode is, however, not a perfect short circuit but does have an appreciable internal resistance. The value of this resistance depends partly on the voltage applied to it and partly upon the resistance of the circuit to which it is connected. This characteristic is such that the diode has a lower internal resistance to large voltages than to small voltages[3]. Therefore, some of the voltage in excess of the bias will appear across the internal resistance of the diode and will be passed on to the following audio circuits. In order to reduce the effect of this internal resistance, a logical step is to connect a resistor in series between the detector output and the limiter so that the combination of the two resistances will act as a voltage divider which steps down the amount of voltage passed on to the audio circuit when the diode conducts *(see Fig. 4)*. This is a common practice in the more effective type of shunt limiter and while it also reduces the audio voltage even when the diode is not conducting, its effect on reducing the noise pulses exceeding the bias is proportionately much greater.

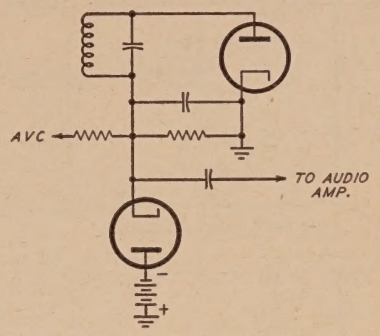


Fig. 3. The short circuit noise limiter is popularly referred to as a "shunt type."

This circuit looks capable of doing the job on a good steady signal where the bias can be set to barely let the audio peaks go by untouched but clip all the noise pulses down to about the same peak value. However, one of the sad facts about radio reception is that most signals fade so rapidly that it would be impossible to follow the signal level with a manual bias control. Thus, a setting proper for a weak signal would severely clip strong signals. Some early noise limiter circuits with manual threshold controls were almost totally useless on fading signals. Fortunately, the bias

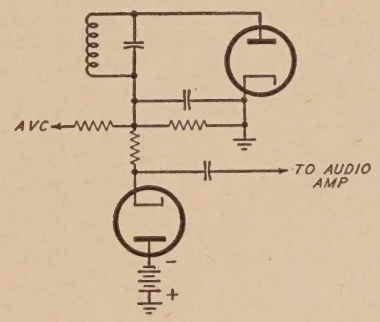


Fig. 4. Inserting a resistance between the detector output and the limiter reduces the effect of internal resistance of the diode.

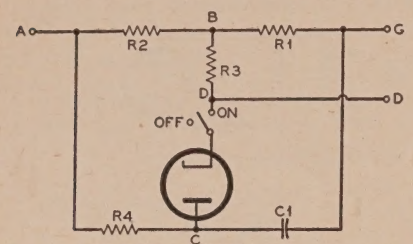
setting can be taken care of automatically by the same source from which the receiver automatic volume control bias is obtained. This provides a d.c. bias which is proportional to the carrier level and by adjusting the proportion of audio voltage and automatic bias applied to the limiter from the second detector, the limiter can be designed to clip all voltages above a predetermined percentage

3. "Noise and Output Limiters," Emerick Toth, Electronics, p. 114, (Part I), Nov., 1946; p. 120 (Part II), Dec. 1946.
4. "Suppressing Impulse Noises," D. C. Rogers, Wireless World, Dec. 1949, p. 489

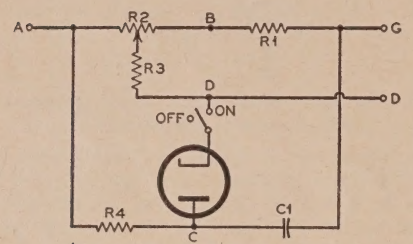
of modulation. By making one of the resistors of the circuit a potentiometer instead of a fixed resistor, a percentage of modulation at which limiting begins can be selected and the limiter will automatically clip at the selected level no matter how much the signal is fading.

Clipping Percentage

For those who prefer extreme simplicity, a fixed



(a) FIXED LIMITING LEVEL



(b) ADJUSTABLE LIMITING LEVEL

POINT "A" IS OUTPUT TERMINAL OF RCVR. 2ND DETECTOR. POINT "D" IS NOISE-LIMITED AUDIO OUTPUT TERMINAL. POINT "G" IS GROUND.

Fig. 5. Two of the most commonly employed shunt type noise limiters. The top circuit (A) uses a fixed ratio of R2 to R1 to determine the clipping level. The bottom circuit (B) features a variable element to determine this level.

percentage of clipping can be quite satisfactory, the amount depending on the listener's taste and the amount of noise to be tolerated. Actually, many listeners barely detect distortion due to clipping of modulation peaks when a limiter is set to clip as low as 30 to 40 percent modulation. It has been determined that this is about the overall percentage of modulation of signals usually encountered. A little thought will show, however, that where speech clipping or automatic speech level controls are used in the transmitter being received, a fixed-level noise limiter set for effective limiting for the majority of incoming signals might cause some bad distortion of signals having high average modulation percentages.

The basic reason for setting the limiter to the average percentage of modulation rather than at 100% is so that it can bring all the noise peaks down close to the average audio signal level and give the signal a better chance to compete with the noise.

Figure 5 (a) shows a representative shunt limiter suitable for connection between a diode second detector and the first audio amplifier grid. *R1* and *R2* make up the detector load resistor and should total about the same as the value presently in the receiver to be modified. The usual value found here is about 500k. *R4* and *C1* provide the automatic bias for the diode. The product of *R4* and *C1* should be large enough so that the voltage at point *C* in the circuit will not be changed by the audio voltage coming from the detector but not so large that point *C* cannot follow fluctuations due to a fading carrier. *R3* is the series dropping resistor which provides the voltage divider action previously discussed. The value of *R3* should be about equal to the value of the grid leak of the audio amplifier to which the output of the limiter is connected. In most receivers the grid leak also functions as a volume control and *R3* should be approximately equal to the total value of the volume control. The value for the volume control or grid leak in many receivers usually will be about 500k. Too large a value of *R3* with respect to the input resistance of the audio stage will cause a loss of audio voltage and too small a value will decrease the effectiveness of the limiting. A 1:1 ratio of *R3* to audio input resistance will drop the available audio only 6 db (½) and most receivers will have plenty of reserve audio gain to make up for this loss. An audio coupling condenser should be used between the limiter and the volume control or audio grid lead to prevent any d.c. voltage from getting onto the audio grid.

The ratio of *R2* to *R1* determines the percentage of modulation at which the clipping action takes place. Neglecting the internal resistance of the diode, a ratio of 1:1 will cause the diode to clip at 100% (with no a.c. load or with no infinite audio stage grid leak). With a value of *R2* equal to one-half *R1*, clipping will take place at 50% modulation. Where a variable modulation percentage selection control is not used, the author recommends that the value of *R2* be no greater than 40% of *R1* which corresponds to a 40% modulation clipping level. (See *Table I* for typical values to be used for 40% clipping.)

R_3 = 500k	C_1 = 0.05 uf	R_4 = 1.0 Meg	
% limiting	R_2/R_1	R_2	R_1
100%	1/1	250k	250k
50%	1/2	166k	333k
40%	2/5	140k	360k
30%	1/3	125k	375k
0-100%	1/1	250k pot.	250k

Table I. Typical values for 40% clipping.

Taking diode internal resistance into account, the percentage at which clipping occurs will be somewhat greater than 40% on weak signals and will come almost down to 40% on strong signals. Because the diode internal resistance is so dependent upon signal voltage levels as well as circuit constants it has been convenient, in the tables of typical circuit values and in the discussion of the operation of the various limiter circuits, to neglect this factor when figuring the modulation percentage

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A Monthly Department Edited by Louisa Sando, W5RZJ*

In grateful recognition of their outstanding service as amateur radio operators, Frank and Sandy Sarver, W6AOR and W6YRL, have been awarded by the U.S. Marine Corps a Certificate of Appreciation. You can see it in the photo on the top of their desk.

Countless are the hams who have helped GIs in all branches of the service by handling traffic and personal QSOs. Frank and Sandy's work is a particularly shining example in that it's covered some 13 years and in the tremendous volume they've processed. It started back in the '30s when Frank began handling a large amount of traffic from XU8NA, the Marine Corps ham station at Shanghai.

Among the hams at XU8NA were F.A. Martin and Gene Goss. All of the traffic was handled on 40 meters. Frank kept the schedule at 4:00 a.m. every morning seven days a week for over three years. The Sarvers' mail used to come each morning in a stack held by a rubber band so numerous were the messages to be sent to China. Occasionally people would send three-page letters, being ignorant of procedure. Sandy would condense them and then reseal the letters and mail them on to the boys in China—transmitting the important information by air. In those days she did not have a ticket, so "all" she could do was help get the traffic ready each evening. They had an automatic perforator and Wheatstone transmitter at that time, and she'd get it all punched out for the morning schedule. Frank would get up at 4 a.m. and keep the schedule—sometimes the contacts ran until 8 a.m. if band conditions permitted. Then during the day Sandy would type up all the messages he took from China and mail them, sometimes by air, to all parts of the United States.

Naturally, the Marine operators and the Sarvers became good friends, and they finally met personally Dec. 6, 1941, when the operators of XU8NA visited the Sarver QTH. The next day while reminiscing of China days the radio interrupted them with news of the Japanese attack on Pearl Harbor. During the first couple of war years Frank and Sandy saw quite a bit of Martin when he was stationed at Pendleton. He used to visit them almost every week-end and bring a few of the boys. Then they lost track of Martin—he was somewhere in the Pacific, and that's all they knew.

Sandy got her own ticket in January of 1947, and one night when Frank and W6PUZ were calling on W6ADP she was tuning the 10-meter band. Frank had just completed the 10-meter transmitter and put up their 4-element wide-spaced beam 65 ft. high on a steel tower. Sandy heard a very familiar voice say, "This is W6YOT/C6 Tsingtao China testing." It was Martin. She called him, signing her own call, and he came back with the usual formalities. When he turned it back and she told him she was W6AOR's XYL he really let out a yell. From then on they had daily schedules until he left China and returned to the States.

For a time Martin was stationed in Arlington, Va., and signed W4NTR, and the Sarvers worked him there. But during that time they handled a good deal of traffic from Okinawa, Guam and Japan for many stations; also quite a bit from Germany.

The outbreak of the Korean conflict found the Marines back in the Orient and the Sarvers again spending long hours at their rig. At JA2MB in the Marine Barracks in Yokosuka, Japan, Frank and Sandy found two old friends to help them. They were Martin and Gene Goss, now a major and in charge of the ham station. The peak traffic came during



Frank and Sandy Sarver, W6AOR and W6YRL, in their ham shack where they've handled so much traffic and so many personal QSOs for men of the Marine Corps that the Corps has awarded them a Certificate of Appreciation.

Address all letters and correspondence to 959C-24th Street, Los Alamos, New Mexico.



All licensed YLs in the Panama Canal Zone have formed the Canal Zone Q R Marys, newest of the YL clubs. From left to right, sitting: KZ5DG (secretary), AC (president), LM (vice president), and standing: CN, NN, BM, KA, GQ, and ML (activities manager).

and after the epic breakout of the First Marine Division at the Chosin Reservoir. Keeping their schedules seven days a week the Sarvers handled an estimated 40% of the six thousand messages processed.

"When Frank is home he always handles the schedules—when he's at work (sound engineer at RKO), I do," says Sandy. "And that makes it nice because the boys always know there will be someone here to keep them. That is seven days a week during the 10-meter season. Martin has always had first call on this station. We would clear him of everything coming this way and then very often just leave the receiver on his frequency in case someone else came into his shack who wanted to reach home. Lots of times I have been in the middle of ironing or cooking dinner when Martin would call. All he'd say was, 'W6AOR—still there Sandy?' and I'd run like mad and throw the switch and say, sure.

"The bulk of our traffic was either mailed, phoned, or wired. On a few occasions I passed some on to the Mission Trail Net. Sometimes we would clear them direct ourselves on 10 in the morning. WØCZE used to stand by lots of times to see if we had anything for St. Louis. I remember one afternoon I was working JA2HQ and he had rush traffic for St. Louis. I relayed to WØCZE, he phoned the message and got an answer which I sent to Japan all in less than ten minutes. All of which speaks well for ham radio."

The Sarvers' story was dramatized on the "Marines in Review" program over the ABC network on April 29th. The whole half hour was dedicated to amateur radio and the last half was the story of their activities with the Marine Corps. At the end of the program Brig. Gen. J. C. McQueen, USMC, Director of Public Information, read a letter to the Sarvers telling them of the award. There was a roll of drums and he read the Certificate: "United States Marine Corps—In grateful appreciation to Mr. and Mrs. Francis M. Sarver for cooperation and assistance so generously extended in maintaining and furthering the interests and activities of the Marine Corps, and for demonstrating the spirit so necessary to the success of the national defense. Your individual efforts will stand as an outstanding example of initiative, devotion and loyalty to the best interest of our Corps and of our Nation." Signed, Lemuel C. Shepherd, Jr., General USMC, Commandant of the Marine Corps.

"It was one of the greatest thrills of our lives!" say Frank and Sandy.

To which we can only add, well done, and congratulations!

New YL Club

Congratulations and welcome to the newest YL club to be formed. Known as the **Canal Zone Q R Marys**, the club includes all of the presently licensed YLs in the Panama Canal Zone—nine to date. **KZ5AC**, Angela Combs, has been elected president; **KZ5LM**, Lois Magner, vice president; **KZ5DG**, Grace Dunlap, secretary; **KZ5ML**, Martha Lerchen, activities manager. All of the gals operate 10-meter phone, and those who don't work during the day usually are to be found any afternoon the band is open about 100 kc apart. The poor OM who happens to have a day off probably wishes the gals would go back to their housework!

Of the Q R Marys, **KZ5AC**, Angie, was the first to be licensed in the Canal Zone, getting her ticket in July, '49, just one month after her OM got his. Angie, who was born in the Zone, holds down a job with the Army so hamming is confined to week-ends when she shares the rig with her OM, KZ5PC, and daughter Carol, KZ5GQ. Favorite frequency is 29.130; she also operates in MARS. Daughter Carol, **KZ5GQ**, was the first teenager to get her ticket and is still the youngest operator in the Canal Zone. She is a freshman in high school. Son Bruce is getting interested and this may soon be another all-ham family. A lot of you will be seeing the Combs family in person for they're taking off for a Stateside vacation, with plans to visit about fourteen different states, and of course plenty of hams along the way, as well as the West Gulf Division Convention in Corpus Christi the end of June.

KZ5LM, Lois Magner, was the second YL in the Zone to receive her ticket, going on the air only a couple of months after Angie. She also is in MARS. Hailing from Washington, D.C., Lois operates as W4UPJ when in the States. She and OM KZ5NM have three jr. ops.

KZ5ML, Martha Lerchen, born in the Canal Zone, is the XYL of KZ5FL. They have two jr. ops, one being KZ5LF, aged 16. Martha works on 28.640 or 28.960 and

(Continued on page 68)

Ionospheric Propagation Conditions

Forecasts by GEORGE JACOBS, W2PAJ*

After a wait of almost five years the amateur 15 meter band is now a reality. Now that many of us have already become somewhat familiar with the band during the past two months, it is of considerable interest to determine just what kind of band 15 meters will be in the future. How good will it be for DX? Can it be used for short haul QSO's? Will there be much sporadic E propagation on this band, etc?

To answer these questions and to determine just what we can expect from this band, a special propagation analysis was undertaken. The results of this analysis will be presented in this and the August issue of *CQ*.

Basic propagation data used in this analysis was obtained from the Central Radio Propagation Laboratory of the National Bureau of Standards, and appears in the CRPL Series-D Publications and in National Bureau of Standards Circular 462.

From a DX viewpoint, 15 meters is going to be a good band. There are indications that for certain DX paths it may be the best DX band we have. During the next year or two its DX characteristics will be similar to the ten-meter band during the period of high sunspot activity, 1947—1950. The 15-meter band should give amateur radio a worthy replacement for the loss to nature and the sunspot cycle of the 10-meter band. Some DX activity can be expected on 15 meters right through the sunspot minimum years of 1954 and 1955. It is expected to be a hot DX band as solar and ionospheric activity increase around 1957.

In determining the usefulness of the band for various DX circuits, we must make a study of maximum usable frequencies (MUF) and absorption. It is these two factors that determine whether the electromagnetic energy radiated by an antenna reaches a far distant point.

Ionospheric absorption is due principally to the action of the sun. Ultra-violet rays emitted by the sun are thought to be the ionizing agent that produces the various layers of the ionosphere. The ionosphere consists of free electrons and molecules of gas. As a radio signal passes through the various layers of the ionosphere, the free electrons are set into motion. These free electrons, under certain conditions, will collide with the gas molecules, and, during collision, lose some energy. This energy comes from the electromagnetic radio wave, which thus loses it and becomes absorbed or attenuated. The amount of energy lost by the wave depends on the number of collisions made per second and is a function of frequency. As frequency is increased, the motion imparted to the free electrons of the ionosphere is less and the number of collisions occurring per second is also less than at lower frequencies. It has been determined, and this is very important, that high frequency ionospheric absorption is very nearly inversely proportional to the square of the frequency. This means that the higher the frequency we transmit on, the lower the absorption, and all other factors being equal, the stronger will be the field intensity of the received signal. Ionospheric absorption at 15 meters is one-half that at 20 meters and almost one-ninth that at 40 meters. Therefore, from the standpoint of signal strength, 15 meters will give us much stronger signals than 20 or 40 meters.

The maximum usable frequency (MUF) of a particular circuit is the highest frequency that can be used for effecting communications for the circuit. Frequencies above the MUF will either be lost in outer space, or returned to earth at a more distant point. Since daily value of MUF's are subject to considerable variation due to variations in the iono-

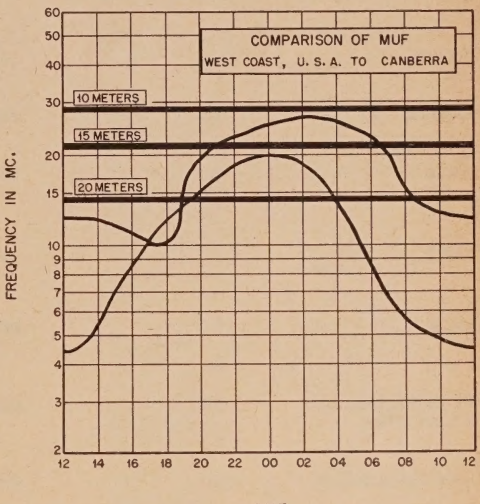


Fig. 1. Circuit analysis on a West Coast USA to Oceania terminals.

sphere itself, the monthly median value of MUF for any particular circuit is by definition the highest frequency that can be used for at least half the days of the month.

The MUF of a circuit is determined by the degree of ionization in the ionosphere. For a particular circuit it may vary hourly, daily, seasonably and throughout the sunspot cycle. Since it requires less ionization to produce an MUF of 14 mc than it does

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**Address all correspondence to 3620 Bedford Ave., Brooklyn 10, N. Y.*

EAST COAST TO: (Centered on Washington, D.C.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Scandanavia	Nil	Nil	1100-2100 (1-2) 2100-0030 (3)	0200-0330 (1)
Great Britain & Western Europe	Nil	Nil	1100-2100 (2-3) 2100-0030 (3-4)	0300-0500 (2)
Balkans	Nil	Nil	1100-1900 (1-2) 1900-0100 (3)	0100-0400 (1-2)
Central Europe	Nil	Nil	1100-2000 (2) 2000-0100 (3-4)	0300-0400 (1-2)
Southern Europe & North Africa	Nil	2000-2230 (1-2)	1000-2100 (2-3) 2100-0130 (3-4)	0100-0500 (2-3)
South Africa	Nil	1630-1800 (2)	0500-0700 (1) 0930-1900 (0-1) 1900-2130 (1-2)	0200-0500 (2)
Near East	Nil	Nil	1100-2000 (1) 2000-0100 (2-3)	0100-0300 (1-2)
Central America & Northern South America	Nil	1600-2200 (2-3) 2200-0200 (3-4)	1100-1400 (3-4) 1400-2300 (3) 2300-0500 (4-5) 0500-0700 (3)	0000-0900 (3-4)
South America	Nil	1300-0100 (3-4)	1000-2200 (1-2) 2200-0600 (4-5) 0600-1000 (1-2)	0100-0900 (2)
Hawaii	Nil	0100-0300 (2)	1500-0300 (1-2) 0300-0600 (3)	0500-1000 (2)
Oceania	Nil	2300-0200 (2-3)	2100-0200 (1) 0200-0700 (3)	0600-1100 (1-2)
Guam	Nil	Nil	1330-1600 (1-2) 1600-0230 (1) 0230-0430 (2)	0830-1130 (1)
Japan	Nil	Nil	1300-1600 (1-2) 1600-0200 (1) 0200-0400 (1-2)	0800-1000 (0-1)
India	Nil	Nil	1700-0000 (0-1)E 1500-1800 (0-1)A 0000-0200 (1) E	Nil
Philippine Islands & East Indies	Nil	Nil	1130-1400 (2) 1400-0000 (1) 0000-0200 (2)	Nil
West Coast USA	Nil	1800-2300 (1-2)	1500-0000 (2-3) 0000-0400 (4)	0300-0800 (3-4) 0800-1200 (2-3)
CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Great Britain & Western Europe	Nil	Nil	1200-2130 (1-2) 2130-0030 (3-4)	0230-0530 (2)
Central Europe	Nil	Nil	1200-2200 (1-2) 2200-0100 (3-4)	0300-0500 (1-2)
Southern Europe & North Africa	Nil	2100-2230 (0-1)	1200-2200 (2-3) 2200-0130 (3-4)	0200-0600 (2)
South Africa	Nil	1600-1800 (1-2)	1000-1900 (0-1) 1900-2200 (1-2) 0500-0700 (1)	0100-0500 (2)
Central America & Northern South America	Nil	1700-0200 (3-4)	1200-1500 (3-4) 1500-0000 (3) 0000-0800 (4-5)	0100-1000 (3-4)

CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Hawaii	Nil	0100-0300 (2)	1500-1700 (2) 1700-0400 (1-2) 0400-0630 (3-4)	0500-1200 (2-3)
Oceania	Nil	2300-0400 (2-3)	2000-0500 (1) 0500-0900 (2-3)	0700-1200 (2)
Japan	Nil	Nil	1230-1500 (2) 1500-0500 (1-2) 0500-0900 (2-3)	0930-1200 (1-2)
Philippine Islands & East Indies	Nil	Nil	1300-1700 (2) 1700-0400 (1-2)	Nil
India	Nil	Nil	1200-1400 (1-2)A 1800-0000 (0-1)A 2300-0200 (1-2)E	Nil

WEST COAST TO: (Centered on Sacramento, Calif.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Europe	Nil	Nil	1400-2300 (1-2) 2300-0200 (2-3)	0500-0800 (0-1)
South Africa	Nil	Nil	0500-0700 (2) 1300-2100 (0-1) 2100-0200 (1-2)	0300-0600 (1-2)
Central America & Northern South America	Nil	2000-0300 (2-3)	1300-0300 (3-4) 0300-1000 (4-5)	0400-1000 (3-4)
South America	Nil	1900-0330 (3)	1300-0100 (2) 0100-0900 (4)	0300-1000 (2-3)
Hawaii	Nil	0000-0500 (3)	1600-1800 (4) 1800-0200 (3-4) 0200-0600 (5) 0600-1100 (2-3)	0500-1200 (3-4)
Oceania	2300-0400 (1)	2100-0600 (2-3)	1900-0400 (1-2) 0400-0900 (2-3)	0500-1400 (2-3)
Japan	Nil	2100-0000 (1) 0600-0800 (1)	1600-0600 (2-3) 0600-1000 (3-4) 1000-1400 (2-3)	1000-1200 (1-2)
Philippine Islands & East Indies	Nil	0400-0700 (2-3)	1500-2100 (3) 2100-0900 (1) 0900-1500 (1-2)	1200-1300 (0-1)
Alaska	Nil	0400-0700 (2)	1600-0500 (3-4) 0500-1000 (4)	0600-1400 (3-4)
Marshall Islands	Nil	0100-0600 (2)	1600-0600 (2-3) 0600-1200 (3-4)	0700-1400 (2-3)
Guam	Nil	0200-0630 (2)	1500-1900 (3) 1900-0700 (1-2) 0700-1200 (2-3)	1000-1130 (2-3)
India	Nil	0300-0600 (1)	1400-1600 (2-3) 1600-0700 (0-1) 0700-1000 (2)	1200-1330 (0-1)

Symbols for Expected Percentage of Days of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more

Special Note: The letter "A" appearing after the expected percentage figures is used to denote that the angle of signal arrival will probably be best over the "Asiatic Path." The letter "E" denotes an azimuth favoring arrival over the "European" path.

to produce 21 mc, 20 meters can be propagationally useful considerably more hours per day and months per year than will 15 meters. By the same token 15 meters will open for far greater periods of time than will 10 meters. During times of day when the MUF is above 21 mc, both 15 and 20 meters may be open simultaneously, when this is so, as previously explained, 15 meters should be the better of the two bands because of considerably less signal absorption.

It requires a relatively large amount of ionization to create an ionosphere intense enough to reflect a frequency of the order of 21 mc. Since the sun is thought to be the ionizing agent, 21-mc transmission, for the most part, will be possible only during daylight hours. Year round openings should be possible on North-South paths to Central and South America and Oceania. East-West DX will for the most part be possible during the Fall and Winter months.

The following table should be useful for determining how many months a year the MUF exceeds 21 mc for certain paths, and can also be used for a comparison between the usefulness of the 15-meter and 10-meter bands for the next year.

1952	Peak MUF Washington, D. C. Tangier	Peak MUF St. Louis Rio de Janerio	Peak MUF Sacramento Canberra
March	23	30	32
April	22	31	33
May	21	28	31
June	21	25	28
July	20	24	27.5
August	19.5	27.5	26
September	21	28	27
October	28	29	32
November	29.5	29	32.5
December	28.5	27.5	28.5
1953			
January	26	25	25
February	26	28	30
Total Months 15 Meters Usable	10	12	12
Total Months 10 Meters Usable	3	7	8

Figure 1 illustrates some of the other factors we have discussed. The figure is a circuit analysis chart for a West Coast USA to Oceania path. Notice that the MUF for this circuit does not quite reach 28 mc, so very little possibility exists for any 10-meter openings. Fifteen meters should open at 2100 GMT (1:00 p.m. PST), and remain open until 0630 GMT (10:30 p.m. PST), a total of 10½ hours. The absorption or LUF curve for this circuit is below the 15-meter band, although it approaches it between 2300—0100 GMT. For the most part, therefore, 15-meter signals should not be badly affected by ionospheric absorption. Twenty meters is below the MUF between 1900 GMT (11 a.m. PST), and 0900 GMT (1:00 a.m. PST), or a period of 14 hours, which is a considerably longer period of time than 15 meters is open. The LUF curve however, from about 1900 GMT to 0400 GMT, is above the 20-meter band (but below the 15-meter band). This indicates that absorption is high enough to considerably attenuate 2 meter signals and on many days the circuit will not be possible or signals will be considerably weaker than 15 meter signals. In other words, considering MUF's and ionospheric absorption, 15 meters should be usable, with good signal intensities for about 8½ hours a day while 20 meters will be usable for only 5 hours a day. On long circuits of this type, 15 meters, at least for the next few years, should be the best DX band available to amateurs. The factor of less ionospheric absorption on 15 meters is also an advantage to low power operators. It means that low power on 15 will in many cases do a job that will require considerably higher power to accomplish on 20 meters.

Next month, I will continue this analysis of the 15-meter band, discussing short-haul, Sporadic E and Ground-Wave transmission.

No severe ionospheric disturbances are expected during the month of July. Below normal conditions may exist on July 1-2, 20-24 and 27. Above average conditions are expected during July 4-6, 8-9 and 30-31.

General Propagation Conditions July, 1952

EUROPE

No ten meter openings are expected until next October. . . . The peak values of MUF between Europe and the USA are approximately 19.5 mc during July. This means not many openings are expected for 15 meters except possibly for an occasional erratic opening to South West Europe from Eastern USA on propagationally good days. Signal levels will be weak, QSB heavy. . . .

Conditions on 20 meters should be about the same as they were in June. On many days the band will open as early as shortly after local sunup, but high absorption will keep signal intensities low until late in the afternoon. Circuits should be possible from all sections of the USA to all areas of Europe. . . . High absorption and increased atmospheric noise levels will limit the usefulness of 40 and 80 meters for DX to Europe, but some "all dark" openings can be expected on propagationally quiet nights.

SOUTH AMERICA

Maximum usable frequencies are not expected to go above 24 mc, on these circuits and no ten meter openings are expected except possibly for a very occasional erratic opening from the South Central section of the USA. . . . Fifteen meters should provide some good reliable DX circuits from all countries of South America to all areas of the USA. . . . Twenty meters is expected to be open almost around the clock, but high daytime absorption will not permit strong signal levels until very late in the afternoon, one or two hours before local sunset.

Forty meters is expected to open fairly regularly between all areas of the USA and Central America and Northern countries of South America. Less frequent openings of a more erratic nature are expected for eighty. Both 40 and 80 meter circuits are "all dark" paths and will open after local sundown and before local sunrise.

AFRICA

No ten meter openings expected. . . . Some 15 meter openings possible from Eastern and Central USA to Central and South Africa. Openings may be erratic, characterized by weak signals and deep fades. . . . Summer absorption and high noise levels will not permit many daytime 20 meter openings between the USA and Central and South Africa and 20 meter DX on these circuits will be considerably poorer than they had been during the Spring months. . . . Some 40 meter openings are expected, but not too many DX possibilities to Africa are expected on 80 meters until Fall.

AUSTRALASIA

The daytime peak value of MUF between the West Coast USA and Australia is approximately 27.5 mc. Occasional ten meter openings may occur on propagationally good days, but 10 meter DX possibilities on these circuits are becoming quite poor. No ten meter openings expected from the Central or Eastern sections of the USA. . . .

I may be a bit optimistic on the possibilities of 15 meters to Australasia, but circuit analysis indicates that fairly good openings can be expected between all areas of the

(Continued on page 62)

Men of Radio

WILLIAM R. WELLMAN

PART II

Situated as we are in mid-century and surrounded by a multitude of such developments as radar, television and world-wide communications, it is often difficult for us to realize that radio communication is only fifty years old and became a commercial reality, appropriately enough, just at the turn of the twentieth century.

Of course, much of the groundwork for the new industry had been laid by Hertz and others during the 1880's, but the real test of the value of the art, the utilization of radio waves for long-distance signaling, came toward the end of 1901.

Many things of great importance had taken place during that year. In September, Theodore Roosevelt entered the White House, succeeding the murdered McKinley. The Boer War was making headlines that year, and thousands of people were heading hopefully for Nome, Alaska and the great gold rush.

Guglielmo Marconi

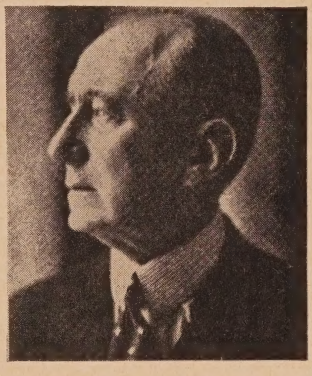
On a hill in Newfoundland that December, another event was taking place; one that was destined to materially alter the future of commerce and industry and to effect profoundly the mode of living of everyone. An observer that December day might have seen a small group of men struggling to control the flight of a large kite, sent aloft from a rocky eminence at the entrance to St. John's harbor.

Trailing from the kite there is a wire which enters a nearby building. Inside, a young man is concentrating upon an assortment of electrical apparatus arranged on a table before him. As noon approaches, his expression becomes more intent. Twelve o'clock passes, then twelve-thirty. Very soon now, the strain will be over and he will know whether his work of the past six years will be climaxed by a supreme triumph. Tomorrow the newspapers of the world will either note that the young man has performed another of his interesting experiments or will hail him as a benefactor, the creator of a new mode of communication.

He continues to wait, a telephone receiver held tightly to his ear. Suddenly he hears something; three faint clicks in the receiver, repeated several times. There can be little doubt that his experiment has succeeded, yet he is ever the cautious scientist. Passing the receiver to his assistant for confirmation, he asks: "Can you hear anything, Mr. Kemp?" Kemp nods, indicating that he too has heard the three faint clicks. Thus was accomplished the twentieth-century miracle of long-distance wireless communication. The waves had spanned the Atlantic, traveling 1700 miles from Cornwall, in England. Since that time, countless numbers of children and students have asked parents and teachers the question: "Who invented radio?" and have received the answer: "Marconi."

To be technically correct, Marconi did not "invent" radio. But he did produce the first commercially practicable system of wireless communication over long distances. His accomplishment was not the result of any single discovery or invention, but comprised, instead, the refinement and the adaptation to his purposes of existing apparatus: Hertz's wave generator, Branley's coherer and his own ideas of an antenna and ground system.

Guglielmo Marconi, born April 25, 1874 at Marzabotto, near Bologna, Italy was the son of Giuseppi Marconi, a local banker, and Anna Jameson of Dublin, Ireland. Anna was the daughter of Andrew Jameson of the famous whiskey distilling family. She had met and married Giuseppi while studying music in Bologna.



Courtesy Harper & Brothers

Guglielmo Marconi (1874-1937)

As a child, the future great man of radio was rather lonely, had few friends. Perhaps this was because he had already developed a serious turn of mind that set him apart from other boys, or perhaps it was because of a language barrier. Although he was Italian-born, he was not too proficient in the language, and his few comrades ridiculed his accent; this was because his mother had always conversed with him in English.

Young Marconi attended no schools, but received all of his education under the guidance of private tutors in Italy and in England. To compensate for his lack of friends, he turned to books for companionship and soon became interested in science. At

the age of twenty he had made a study of Hertz's experiments, became deeply interested and promptly decided that the waves could be used in sending messages over long distances.

For a start, he merely duplicated Hertz's equipment and techniques and his first few trials were failures. He carefully studied his apparatus and procedure, found where his errors lay and after corrections had been made was able to send and receive messages over the length of the house.

He soon realized that further experimentation would take more money than he had; the next step was to interest his father. At first, Giuseppe was skeptical, but after witnessing a few demonstrations agreed to finance his son to the extent of about $1,000. This was an extremely critical phase of Guglielmo's career, since it is probable that he would not have been able to continue experimenting without financial aid and it might have been difficult for him to interest investors in his scheme.

As noted earlier, his first experiments were based upon Hertz apparatus, including the spark coil generator and a spark gap provided with extended rods that functioned as antennae. At this juncture he made some changes in the apparatus that resulted in a startling improvement in results. Dispensing with the rod antennae, he now connected one terminal of the gap to an elevated antenna, consisting of a copper cylinder mounted on a tall mast. The opposite terminal of the gap was connected to the earth. It is interesting to note that for many years thereafter, the elevated antenna, together with the ground connection, remained a necessary part, and indeed a symbol of radio. A grounded antenna is referred to, even today, as a Marconi antenna. There was to be sure, a return to the Hertz antenna, but this was many years later. The grounded antenna, then, may be regarded as Marconi's first contribution to radio.

Although his antenna had materially extended the range of his apparatus, Marconi soon realized that there was little hope of real long-distance communication without an improved receiving system; Hertz's receiving loop was far too insensitive. Soon he learned of the little tube of filings invented by Branly and used by Sir Oliver Lodge, and felt that this device, combined with his antenna system, offered real possibilities. Again his genius for refining and improving came to the fore; Branly's tube was made narrower, the metal plugs placed closer together and nickel and silver filings substituted for the original iron with the result that he was then able to receive signals from a mile away, with the transmitter located on a distant hill and the receiver at the house. Almost as important as the improvement in the range was his discovery that signals could be picked up when the transmitter was placed on the far side of the hill, thus proving that the waves were capable of passing through obstacles.

Despite his success and the steady increase in range, Marconi's work had thus far attracted little attention. Aside from his family, Professor Righi of the University of Bologna and a few others, no one seemed to be interested. Yet the inventor was certain that his system had commercial, perhaps even military value. With this in mind, he offered the results of his research to the Italian government, but the offer was declined.

Disappointed, but not discouraged, he reasoned that his discoveries should be of greatest importance to a nation with broad maritime interests. Even at that early date, wireless seemed bound to the sea. The logical choice among world powers was, of course, England. This was dictated not alone because of England's naval and maritime power, but partly by the fact that his mother had influential friends in that country.

He arrived in England carrying letters of introduction to a number of important personages, including one to Sir William Preece, technical director of the British Post Office. In his position, Preece was responsible for the British telephone and telegraph network, and had once experimented with a form of wireless; the cable extending from

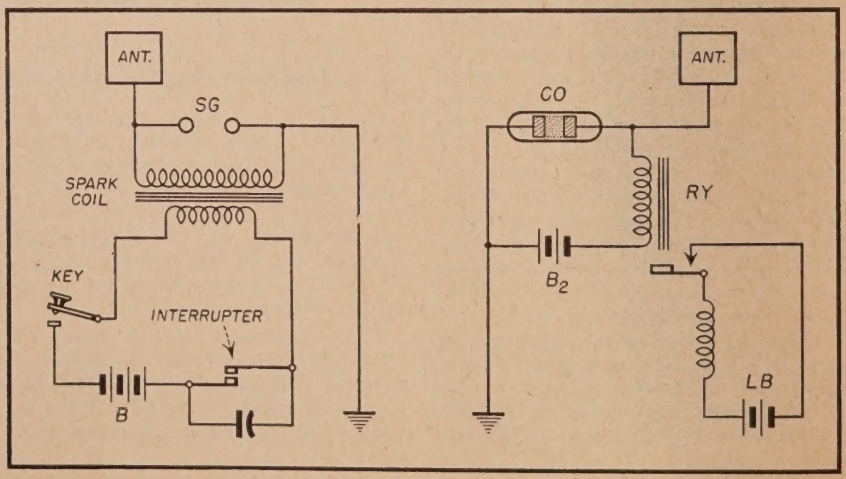


Fig. 1. Early Marconi transmitter and receiver.

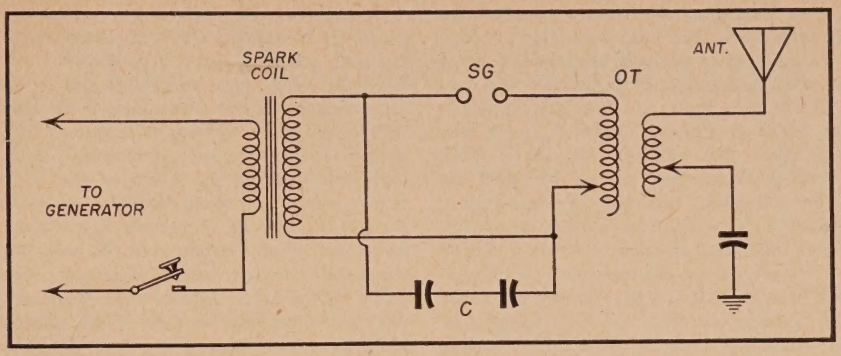


Fig. 2. Later Marconi Apparatus.

the island of Mull to the mainland had parted and by laying parallel wires along the opposite shores Preece had maintained communication through a form of induction telegraph.

Marconi's arrival in England was attended by a rather serious incident that also had a humorous side. A customs inspector, upon examining his instruments, decided that they must be bombs or infernal machines and ordered that they be destroyed. The result of this stupid act was that the progress of radio was delayed for some weeks, until duplicate apparatus could be obtained.

Once established in England with his equipment, Marconi began a long series of experiments in communication over open stretches of country and congested city areas. Once more, it was clearly established that Hertzian waves were capable of passing through most ordinary obstacles. Shortly, the range was extended to nine miles. Just then, his work was almost interrupted by a notification from the Italian government, calling him to military service. Of course, he might have avoided service by renouncing his Italian citizenship and becoming a British subject, but he did not choose to do this. Finally the situation was clarified by an arrangement which permitted him to continue his work as a military student attached to the Italian embassy.

On July 20, 1897, the first company, Wireless Telegraph and Signal Company, Ltd., was formed to acquire and develop his discoveries; Marconi became its chief engineer. Three years later the name was changed to Marconi's Wireless Telegraph Company, Ltd. and for many years thereafter the firm enjoyed a virtual monopoly of wireless communication on both sides of the Atlantic.

One of the first projects of the new company was the installation of apparatus in lightships and lighthouses, at the direction of Lloyd's Corporation. Two lighthouses, seven miles apart, were selected for the initial test, with gratifying results. This was probably the first practical application of wireless in history. The next year equally good results were obtained between a fixed shore station and a moving vessel while 18 miles at sea.

In 1899 the French government invited him to conduct a cross-channel test which was highly successful. Newspaper reporters who witnessed the test gave Marconi much valuable publicity, a fact which probably was quite instrumental in directing public attention and support toward his ideas. Later that year, he clinched public acceptance of wireless communication by sending the results of the international yacht races from a tug, stationed at the Sandy Hook race course, to shore, probably the first instance of the use of wireless in covering a sports event. As the Shamrock and the Columbia, contenders for the famous American Cup sailed the course, Marconi followed, reporting the series in detail, transmitting hundreds of individual reports to shore. The Shamrock, entry of Sir Thomas Lipton, tea magnate and grand old man of yacht racing, lost the event.

During his visit to the United States, Marconi conducted a series of tests for the War and Navy departments; these tests eventually led to the adoption of his system by the military and naval services of a number of world powers.

Now only twenty-five years old, Marconi was well on the way toward international recognition as a scientist, but although he was the leader he was not the only one in search of a commercially acceptable method of wireless communication. The science had progressed to the point where signaling over a 200 mile range was feasible and a race had begun, to extend the range and improve reception. Among those pitted against him in this race were DeForest and Fessenden in the United States and Slaby in Germany. The Russian, Popoff, had achieved notable results as had Bose in India. But Marconi managed to keep far ahead of the field and as early as 1900 decided that even the Atlantic might not prove to be a barrier to wireless. His principal concern, however, continued to center upon communication between ships at sea and shore stations; he visualized powerful land stations on both sides of the ocean having a range great enough to maintain contact with a ship in mid-Atlantic; in this way, a ship would always be in touch with shore and much of the risk of ocean travel would be nullified.

Aside from more powerful sending apparatus and more sensitive receiving devices, the proper

choice of a wavelength seemed to be very important in long-distance work. Fleming, who later invented the first vacuum tube, advised Marconi to use a longer wave. This was kept in mind when construction of the then most powerful station in the world was begun at Poldhu, Cornwall. According to Fleming, the wave emitted was about 1,000 meters. Another factor that seemed to affect the range of a transmitter was the antenna height; accordingly an elaborate antenna system was erected at Poldhu, supported by twenty masts arranged in a circle. Unfortunately, the impressive aerial was never used. Construction of the station proceeded during the summer of 1901 and in August, just when everything was ready for preliminary testing a sudden storm struck, wrecking the carefully built antenna. It was then too late to begin rebuilding in time for the contemplated trans-Atlantic test; thus it happened that the first wireless signals to span the ocean were radiated from a simple, single wire antenna.

Trans-Atlantic Broadcast

Marconi and his assistant, Kemp, left England at the end of November and began work at St. John's on December 9. The government authorities afforded him the use of a building on Signal Hill for housing his apparatus. Prior to the trans-Atlantic trial, Marconi's receiving equipment included a telegraph sounder, or in some cases a recorder which inked the dots and dashes on a moving strip of paper; in either case, the reproducing device was actuated by the coherer. A telephone receiver was known to be more sensitive and was used in the Poldhu-St. John's test in place of the sounder or recorder.

An interesting point arises concerning Marconi's use of a temporary type of receiving aerial, kept aloft by a kite in preference to a more elaborate installation. Seemingly, a kite antenna lessened his chances of success, but on the other hand the cost of erecting masts and a fixed antenna would have been quite heavy and might have been a severe liability in the event of failure. This, together with the fact that much of the work at Newfoundland was shrouded in secrecy seems to give support to the view that he was not primarily interested in spanning the Atlantic. If he failed in the attempt Poldhu was still ideal for his original project of ship-to-shore communication. It is also possible that the trial was partly a master stroke to demonstrate beyond all doubt that his system was superior to all others.

When all was in readiness the Poldhu operator was contacted by cable and instructed to start sending at 11:30 A.M. and to continue until 2:30 P.M. each day, St. John's time. No complete message was to be sent, just the letter "S," repeated over and over. In the choice of time, it is evident that Marconi was extremely lucky, for it is now certain that darkness would have increased his chances of success. Considering the chosen time, and the temporary nature of his sending and receiving antennas, his success was almost miraculous.

When the first day's test was completed, the results were not immediately announced to government officials and the press. This would have been the usual procedure, and due to the careful prearrangement there was little doubt that the signals heard did originate in England but Marconi wanted to be sure and waited until a second test had been made on the following day. Perhaps this is one reason why some confusion exists concerning the actual date of the event. Most accounts give December 12 as the date, but his own statement to the press, released under the date of December 14, states that the first signals were heard on Wednesday, December 11. In spite of his caution and reserve and the emphasis he placed on the embryonic state of the wireless art, his attorney said that in his opinion Marconi had released the news of the success too early. Evidently the original scheme of concentrating on ship-to-shore wireless was temporarily pigeonholed and the Marconi Company proceeded with plans for a two-way trans-Atlantic link. Of course, the first step in such a plan was the construction of a permanent station, preferably at St. John's, but this station was destined never to be built.

Immediately after the news reports appeared, the New York manager of the Marconi interests was interviewed by the press. One of the questions asked was whether he thought wireless would supplant the land telegraph, and he replied that this was a distinct possibility. Even without such a statement, the telegraph companies were already worried, and the interview resulted in genuine alarm. Some companies took the view that they were threatened with extinction, the value of telegraph and cable stocks dropped alarmingly and a fight for survival took shape. One result was that Marconi was served with legal papers prohibiting him from continuing operations within Newfoundland; the basis for this move lay in the fact that the company initiating the action maintained a monopoly over the sending and receiving of telegraph messages in that area and wireless was considered a form of telegraphy.

All plans for erecting a permanent station in St. John's were abandoned and operations were transfered to Glace Bay, Nova Scotia.

The new Glace Bay station was ready for operation by the end of 1902. In the meantime, many improvements had been made in apparatus and techniques. Lodge had contributed tuning methods which enabled an operator to separate wanted from unwanted signals, based upon his original research in the phenomena of resonance. Marconi had introduced the magnetic detector, regarded as a valuable improvement over the coherer, earlier in 1902, and the new detector was added to the installation. The first wireless message in the west to east direction was sent on December 17, and the era of commercially practicable wireless service had begun.

With this phenomenal start, it was not surprising that the Marconi system outdistanced all competi-

(Continued on page 67)

My Mobile Antenna

A. J. SPATOLA, W6DAE*

The 75 meter mobile antenna used by W6DAE has two novel ideas that should be of interest to mobileers; one mechanical and one electrical. —Editor.

On corners and fast stops most whip antennas, having their entire weight of the antenna on the spring, flip around like Douglas Fairbanks with a sword. If the *Master Mount* spring is moved from the bottom of the antenna and mounted at about the same height as the top of the car body, then when the antenna hits a tree or something and starts into action it is at a height where the average, dreamy jaywalker is not apt to be swung into the land of nod. The greatly reduced weight on the spring results in virtual elimination of the usual oscillation.

Figure 2 shows the mechanical construction of a special loading coil which allows the whip to be lowered into it a distance of three inches. Even this small amount of adjustability allows the antenna to be tuned over most of the band. The coil form is made from a piece of 7" X 1½" O.D. polystyrene rod (plexiglass or lucite will do as well). One half inch from each end of the rod a 13/64" hole is drilled to a depth of ½" and tapped with a ¼" SAE. Two ¼" brass bolts, ¾" long, with the heads sawed off are drilled lengthwise through the middle and tapped with an 8-32 tap. This operation gives you two bushings which will hold the set screws in the plastic.

Next, drill a hole on the bottom surface of the coil form to a depth of 1¼"; equal in diameter to the size of the shaft of the whip. This hole can be tapped if necessary to mount on the spring. A similar hole is then drilled in the top surface of the coil form to admit the top part of the whip to a depth of 3". Raising and lowering the whip into this hole permits the antenna to be resonated over most of the 75 meter band. Set-screws are put in the brass bushings and, when tightened, hold the antenna firmly. If you intend to QSY often the top set-screw could be made with a butterfly end for operation with the fingers rather than having to carry a screw driver or set-screw wrench with you all the time.

The next step is to wind the wire on the coil form. Number 15 cotton covered was used here. The bushings on each end of the form can be used as terminals for the ends of the coil. When the coil has been pruned it can be covered with phenol or plastic paint so that rain will not bother it.

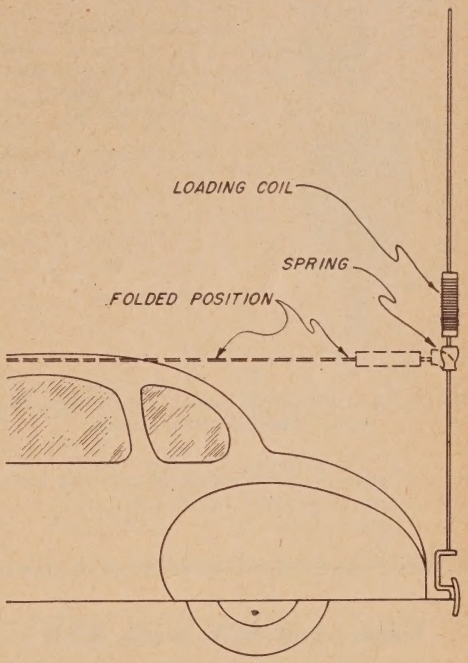


Fig. 1. If you disassemble your Master Mount mobile antenna and put the spring just below the loading coil you will be able to drastically reduce the "layback" and vibration.

The whip is pushed down into the form the full 3" and the coil pruned to 3995 kc by removing turns from the coil. A small transmitter or grid-dip oscillator will indicate resonance. In my particular installation the antenna resonates down to 3850 kc with the whip mostly out of the hole. Notches can be filed on the whip to indicate the resonant frequency adjustments.

For those of you that have not had experience with drilling plastics it is well to point out that this takes a bit of time, care, and a coolant on the drill,

*632 North 15th Street, San Jose 11, California.

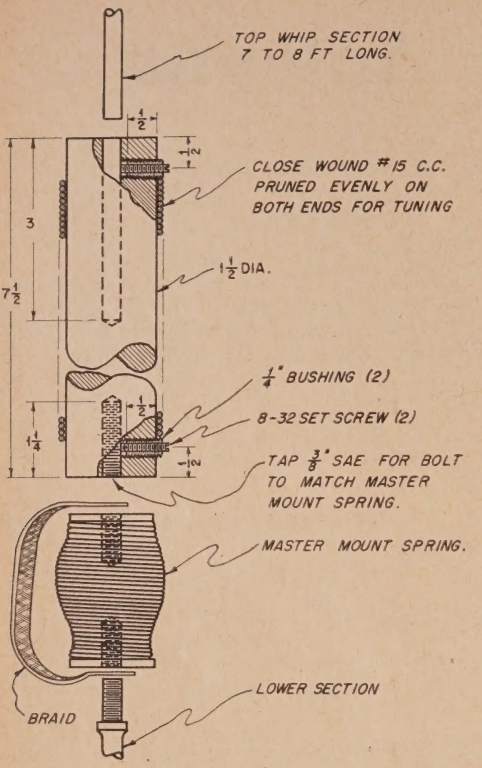


Fig. 2. This is the special loading coil that the author designed for use with his mobile.

such as soapy water. A chunk of poly this size is a bit expensive to make mistakes on.

Improved S/N with FL8

This is a very simple means of improving the signal-to-noise-ratio of any communications receiver employing a crystal filter.

Many amateurs have experimented with the well known FL8 filters, and found that they were somewhat unusable due to their extreme selectivity and consequent ringing. This was very noticeable using the filter in the "Range" position.

However, upon switching over to the "Voice" position, where the filter operates with a rejection frequency of 1020 cycles, a very desirable and noticeable attenuation of the normal crystal "ringing" of the receiver is found. This may be verified by simply switching over to the "Both" position of the filter which is its normal or "out" position.

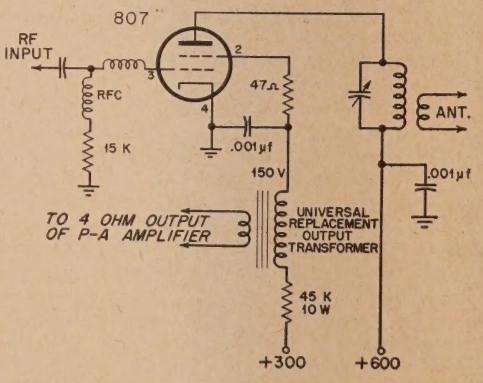
The user will immediately notice that there is no insertion loss detectable by ear, and that a great percentage of the crystal ringing (noise) is rejected.

This gimmick has been in constant use in the writer's receiving set-up for the past two years with a great deal of success. It also offers one the extreme selectivity of the "Range" position when needed and possible to be used. Users are cautioned that an impedence match is necessary for proper characteristics of the filter and no difficulty has been experienced by using any of the common varieties of high Z 'phones found in a ham shack. A 500-ohm speaker winding was tried without success. However, a 500-ohm input to the filter does not impair its efficiency.

MARV GONSIOR, W6VFR

A Lazy-Man's Screen Modulator

Wanting to screen modulate my 807 final on 75 meters, but not having enough time to build a clamp-tube or screen modulator, I began to look about for another method of achieving this end. The following idea was hit upon and put into operation. A 14-watt public-address type amplifier used here to play records and a universal replacement output transformer from the junk box were all that was needed. The voice coil secondary of the output transformer was attached to the 4-ohm output of the amplifier and the primary of the transformer became the secondary. The screen voltage is dropped to one-half its normal CW value through a dropping resistor and fed through the transformer to the screen. The only thing else that needs to be done is to increase the value of the screen by-pass condenser to .001 $\mu\mu$f in order to pass audio frequencies. If the replacement transformer secondary has taps, they should be chosen to produce a fairly high impedance in the screen lead. Values shown in the diagram are those I used, but are likely to be different with other tubes and voltages. Best adjustment is achieved by adjusting the screen voltage to the point where the plate meter kicks the least under modulation. The gain should



be set to that point where the plate meter just kicks on peaks. Two other points should be remembered. First, the loading of the final should be as heavy as possible and still have a dip in plate current at resonance. Second, the grid drive should be kept at minimum necessary to maintain output. This system has been in use for about a month now and reports are that the quality is excellent and the modulation seems adequate.

JAMES H. SCOTT, W9CWH

Ground Plane Matching Network

WILLIAM I. ORR, W6SAI*

Much of the disfavor with which many amateurs view the ground plane antenna can be traced to improper matching. The author says this can all be cleared away with a fixed variable condenser and a few turns of wire. If you are contemplating some low frequency operation, try a ground plane—properly matched. —Editor.

With the current decrease in the sunspot activity there is a slow but steady shift of amateur operation to the lower frequency bands. An antenna gaining in popularity on these bands is the simple ground-plane vertical shown in *Fig. 1.* It is easily constructed, neat in appearance, and an excellent antenna for DX work on these bands.

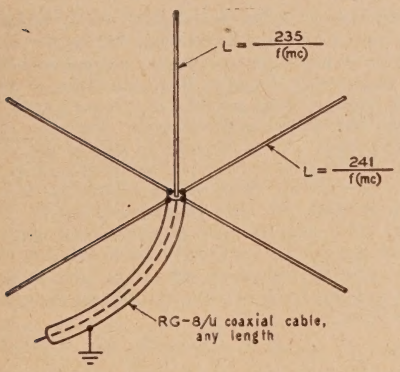


Fig. 1. The usual ground plane consists of a vertical radiator and four radials in a horizontal plane around the base. Although it has a radiation resistance of approximately 32 ohms practically everyone feeds it directly from RG-8/U.

It is practically impossible for the amateur to construct an efficient low angle radiator on the 7 mc band, for example, unless the antenna is vertically polarized. A horizontal array would have to be suspended at least 60 feet in the air to obtain satisfactory low angle radiation for long distance communication. In most cases this height is out of the question. The ground-plane antenna provides this vital low angle radiation and only necessitates a height of 33 feet. Its base can be set directly on the ground if the surrounding area is relatively free of buildings and trees.

Many ground-planes are in use. The chief objection to their more widespread popularity seems to be a reluctance of the antenna to load the transmitter fully. In some cases it will refuse to take any load at all. This fault is caused by the relatively low impedance feed point of the antenna. A ground-plane has a base impedance at resonance of about 32 ohms. Since most amateurs feed their ground-planes with RG-8/U coax, there is a SWR of at least 1.62:1 on the line. If the length of the vertical radiator or horizontal radials is incorrect, the SWR can be even higher. With a SWR of this magnitude the physical length of the coax line becomes a factor in loading. Some fellows prune their line an inch or two at a time until they achieve sufficient loading, which does not change the SWR but merely alters the reactive component at the transmitting end of the line.

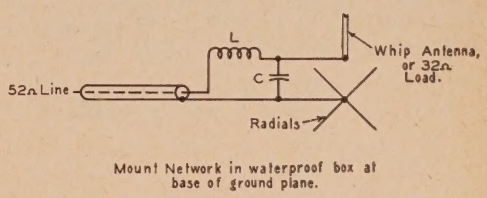


Fig. 2. The "L" network is quite simple.

A much more satisfactory solution, and one that will produce a unity SWR on the coax line, is to use a simple matching device at the antenna end of the line. A simple "L" network that provides a 5:3 transformation will do the trick. The circuit of such a network is shown in *Fig. 2* and suitable constants are tabulated in *Table I.* The condenser may be a 1250 volt (test) mica with a 10% tolerance. The coil may be air wound of heavy wire or wound on a ceramic form. If a coil form is used, the completed coil should be given a coat of clear

*555 Crestline Dr., Los Angeles, Calif.

collodion, or coil dope, to protect it from the weather. This network should be mounted directly at the base of the ground-plane. Prior to installation, the ground-plane should be resonated at an optimum frequency with a grid-dip meter. This will insure that there is a minimum reactive component appearing at the input to the "L" network.

Band	Capacity C (uuf)	Coil L (uh)	Coil Size
80	760	1.14	11 turns #12e, 3/4" diam, 1 3/8" long
40	380	.57	11 turns #12e, 1/2" diam, 1 3/8" long
20	190	.28	6 turns #12e, 1/2" diam, 7/8" long
10	95	.14	3 1/2 turns #12e, 1/2" diam, 1/2" long

Table I

For ordinary use, the constants given in *Table I* will be satisfactory. The purist, however, may wish to alter the constants slightly to provide an exact match. The condenser may consist of a fixed and variable in parallel, while the coil can be made of a surplus rotary inductance. The operation of the network can be easily checked with a coaxial SWR meter.

Using the above formula for the ground-plane dimensions, and this network, it is easy to obtain a SWR of not greater than 1.1:1 over the entire 7 mc band. The use of slightly longer-than-usual radials will help to broad band the ground-plane to a noticeable extent.

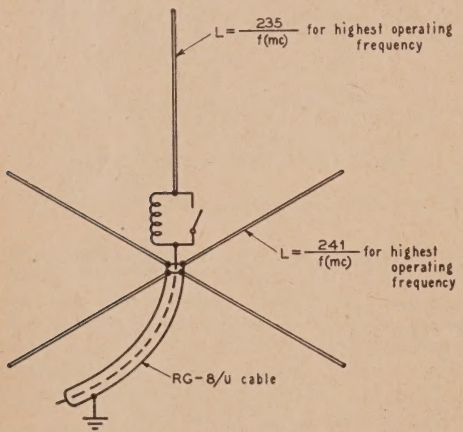
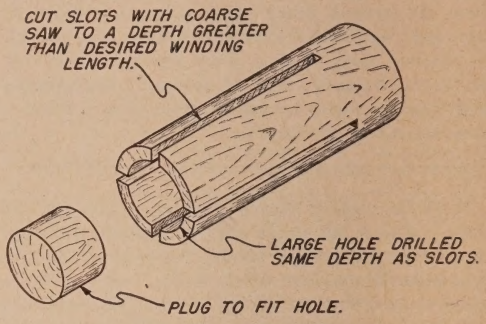


Fig. 3. A method for adding or subtracting sufficient inductance to tune the full 75-80 meter band.

On 75-80 meters the usual ground-plane is too sharply resonant to load over the entire band. If complete coverage is desired, the ground-plane should be cut for some frequency in the high end of the band, and then sufficient inductance added at the base to resonate the antenna at the low frequency end of the band. A switch may be used to add this inductance to the circuit as shown in *Fig. 3.*

Air Wound Winding Form

The simple form for winding your own air core coils shown in the sketch consists of a cylindrical block of wood with a large hole drilled along the axis of the block and two saw cuts made with a coarse saw. Both the hole and the saw cuts must be deeper than the desired winding length of the coil. With a plug cut to fit the hole inserted to hold the form to its original diameter, wind the coil to the desired length and cement it in place with coil cement



(Duco or such). When thoroughly dried, remove the plug and the form will contract due to the saw cuts enough to allow the coil to be removed without damage whatsoever. Three or four thin strips of celluloid cut from a cheap pocket ruler spaced equally around the form make good staves for cementing the windings in place. A heavier strip of poly or the like can then be cemented or clamped on for a base support once the coil has been removed from the form.

At this location, we have forms made up for 2", 1⅝", and 1½", with the hole along the axis drilled the correct size for an old metal tube to be used for the plug. Usually the supply of rolling pins at the local five and dime will produce the correct diameter for these forms.

G. E. VAUGHN, JR., W5RGW.

Fourth Annual Down East Hamfest

The morning of July 26 will witness the inception of another Down East Hamfest, the fourth in a series of festivities presented annually by the Portland Amateur Wireless Association. The center of activity this year will be the Eastland Hotel, and registration there will take place at eleven a.m. PAWA has scheduled the evening banquet, which is the climax of the day's program, for 6:30 p.m. Registration will cost $4.50 per person. Secure your advance registrations from Lee D. Johnson, W1QIQ, 92 William St., Portland, Maine.

Maintaining Mobile Antenna Resonance

W. M. SCHERER, W2AEF*

COVER FEATURE

This is one of the articles that was a "cutback" casualty in the preparation of the our "Special Mobile Issue." Those of you that have heard the "W2AEF Mobile Special" on the air know that this idea is one reason it can get out so effectively. —Editor.

The higher the Q of an antenna, the narrower will be the frequency bandwidth over which satisfactory efficiency may be maintained. In the case of a 4 mc loaded antenna, this may mean a bandwidth of only 20 or 30 kc. For the mobile operator who employs a v.f.o., or who utilizes crystals covering a wide range, some means should then be used for rapidly and conveniently retuning the antenna to resonance from the operating position within the car.

The antenna resonant frequency may be changed either by altering the length of the antenna whip, or by varying the inductance of the loading inductor. The first method is practically an impossibility to accomplish by remote control. Tuning of a center loading inductor would also present extremely difficult mechanical problems, and is virtually in the same class as the first method. Even remote control adjustment of a base loading inductor would be difficult, although not impossible if some means were devised whereby it may be made mechanically strong and may be protected from the weather.

The total antenna inductance may be remotely adjusted, as shown in *Fig. 1,* by employing only partial loading in the antenna itself, and then by making up the difference with a variable inductor mounted in the car trunk.

A unit such as the new B. & W. No. 3852 variable inductor ideal for this purpose, since it may be easily controlled from the dashboard, by means of a flexible tuning shaft.

Referring to the diagram, the inductance of *L2* should be made small, to keep as much of the quarter wave section of the antenna system outside of the car as possible. This will reduce losses at the internal inductor, and at the same time will keep most of the lower impedance, or highest current, portion of the antenna system out in the clear where it has a better chance to radiate. *L1* should be adjusted so that resonance is realized at the highest frequency to be used when *L2* is set for minimum inductance. In order to preserve the Q of *L2,* the tap should be connected so that the unused turns are not short circuited. The initial tuning may be accomplished through the use of a grid dipper, by obtaining the maximum loading at the transmitter, or by checking with a field strength meter for the maximum radiation. If the grid dipper is used, the base of the antenna should be shorted to ground during the measurement. All adjustments should be made with the trunk lid closed.

As the inductance of *L2* is increased, the resonant frequency will be lowered, and a larger portion of the system carrying the highest current will be electrically moved inside the trunk, the inductor losses will go up slightly, and the radiation will also slightly decrease; however, any loss or decrease will be small and, from a practical standpoint, may be considered negligible when compared to the advantage gained by always having the antenna tuned to resonance.

The second method of remote controlled tuning is shown in *Fig. 2.* This is accomplished by means of a variable capacitor which may also be rotated by a flexible control shaft.

The antenna should first be tuned to the lowest desired frequency while both *L2* and *C1* are short

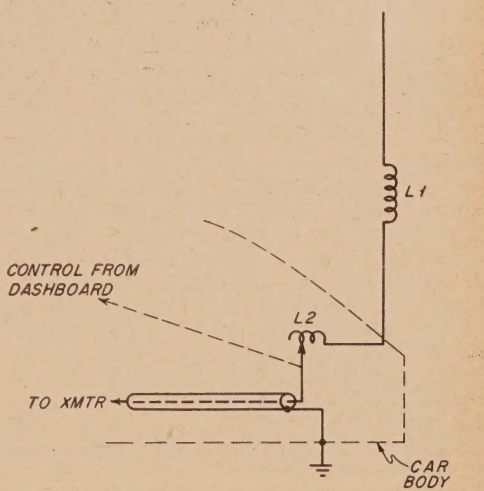
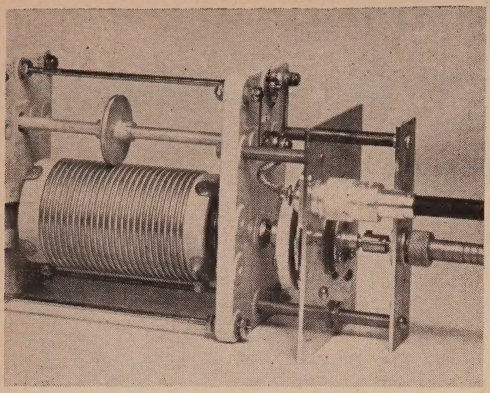


Fig. 1. It is possible to partially load the mobile antenna with a remotely variable inductor mounted in the trunk or luggage compartment.

*Contributing Editor, CQ.



This is a Barker & Williamson type #3852 variable inductor adapted for remote control operation from the dashboard. A National type AN 5:1 ratio planetary drive unit is used to provide smooth control and to reduce the load on the flexible control shaft. An insulated flexible coupling connects the inductor rotor to the drive unit which is attached to a panel mounted on the inductor endplate. A co-ax connector is mounted on the same panel, and it is wired to the slider wheel terminal. A second panel is mounted on the first to hold the fitting which secures the flexible control cable.

The rotor wiper fingers have been removed from the drive end of the inductor both to reduce friction and to eliminate shorting of the unused turns. It was also found necessary to reduce the pressure applied to the slider wheel and to ease the tension at the wiper fingers shown at the left. A terminal of one of these wipers connects to the antenna, and the panel with the co-ax fitting connects to ground.

circuited. *L2* and *C1* should then be reinserted and with *C1* set at maximum capacitance, only enough inductance should be added at *L2* to again produce resonance at the lowest frequency.

An advantage of this arrangement is that, since at the lowest frequency the antenna was tuned without *L2* and *C1*, the lower impedance or highest current section of the antenna is outside of the car. As the frequency is raised by reducing *C1* the low impedance point moves slightly up the antenna. The net result is that a full quarter wavelength of antenna is out in the clear for maximum radiation.

As pointed out by George Brown[1], a certain amount of coupling efficiency may be lost through the use of the tuning capacitor; however, if the size of the capacitor is made large, the loss will be small. A maximum value of at least 700 $\mu\mu$f should be used at *C1*. This may readily be obtained by ganging together several sections of a broadcast receiver capacitor having good insulation. The modified straight line frequency curve of this type capacitor will also make tuning fairly uniform over the range of the band.

At the lowest operating frequency (3.8 mc) with a rear mounted antenna tuned by a variable capacitor and using inductors of good Q, the impedance at the feedpoint, as measured with the *Antennascope*[2] will be found to be a resistive impedance of about 28 to 35 ohms, depending on the individual installation. At the high end of the band (4 mc) the impedance will rise to nearly 100 ohms. The reason for this is that, as mentioned previously, when the frequency is raised, the low impedance point (voltage node) moves up the antenna. The feedpoint is then automatically a greater electrical distance from the center of the antenna (voltage node), and is, therefore, at a point where the impedance is higher. With this arrangement the loading may have to be shifted from one end of the band to the other, since the reflected impedance changes.

Further Notes

When using the variable inductor method, the feedpoint impedance will remain at about 30 ohms over the entire range, since in this method of tuning, the low impedance point, or the center of the antenna, always remains at the ground end. Using either way of tuning, the mismatch with a 52 ohm transmission line will always be within a ratio of 2:1, which is inconsequential where the length of the feedline, as found in mobile installations, is very short in relation to the frequency. For those who may prefer a closer match when the variable inductor is employed, two parallel feed lines, each of 70 ohms impedance may be used.

An important requisite, for this as well as for any other mobile antenna arrangement, is that the car body be made as good a ground system as possible. To do this, all sections of the body should be thoroughly bonded together. This includes the bumper, splash pan, fenders, trunk, chassis, etc. The antenna ground connection, at the bottom of the feedline, should be made positive and direct.

If the antenna is mounted at a place which requires a lead to be run between it and the inside of the trunk, a low capacitance insulator should be used at the feedthrough point.

(Continued on page 66)

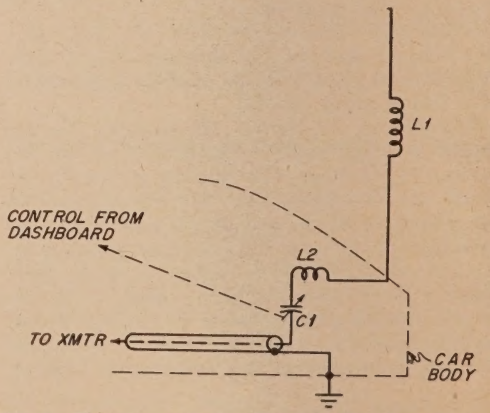


Fig. 2. The same principle shown in Fig. 1 could be applied here by varying the loading through the use of remote tuning condenser.

(1) "High Efficiency Loading Coil for Mobile Antennas," Brown, CQ, Jan. '51.
(2) "Building and Using the Antennascope," Scherer, CQ, Sept. '50.



A Monthly Department Edited by HERB BRIER, W9EGQ*

Good news for Novice operators is the prospect of additional frequencies. The Federal Communications Commission has proposed to permit Novice operation between 7,175 kc and 7,200 kc and to substitute 21,150 kc to 21,300 kc for the present 27-mc assignment.

At their annual meeting in May, the Board of Directors of ARRL voted in favor of a 7-mc assignment, but recommended that it be 7,150 kc to 7,200 kc. They voted opposition to moving the 27-mc Novice band to 21 mc, but they recommended that 51 mc to 53 mc be opened to Novice phone and c.w. operation.

It appears likely that Novice operation on 7 mc will be permitted very shortly, possibly early in July; however, it may be several months before the divergent views regarding the other bands are reconciled and an FCC regulation formulated. Incidentally, almost every amateur with whom I have discussed Novice frequencies believes that the FCC should authorize Novice operation on all amateur c.w. frequencies, retaining present Novice License regulations. It would be interesting to hear the opinions of more amateurs on this idea.

Multi-Band Novice Antennas

Half-wave antennas for the centers of the proposed new bands are 65 feet 3 inches, 22 feet, and 9 feet long, respectively. Few amateurs, however, have either the room or the inclination to erect separate antennas for each band they operate. This is especially true for frequencies below 30 mc. Fortunately, one properly-designed antenna can take the place of several, with no loss in efficiency. Although certain of the Novice bands are subject to change, it seems that now is the time to give some data on such antennas, especially when, as far as I know, no Novice operator wants an antenna usable only in the Novice bands.

Figure 1 shows the current distribution and the resulting radiation pattern of an antenna on its fundamental frequency (the frequency on which it is ½-wave long) and several multiples (harmonics) of this frequency. Each ½-wave segment of a multi-wave antenna radiates as if it were a simple ½-wave antenna, but it takes the r.f. current in the antenna a certain definite length of time (0.5/freq. (mc) seconds) to travel from one segment to the next. As a result, radiation does not occur from each segment at the same moment, resulting in increasing radiation in some directions and zero radiation (a null) in others. (Those who are familiar with Vector Algebra know how differing forces can produce a resultant different from any of the original forces.)

As the antenna becomes longer (measured in wavelengths), the percentage of power in the lobe of radiation closest to the axis of the antenna slowly increases. A 3.7-mc ½-wave antenna, therefore, becomes a rather effective beam antenna in directions approximately twenty-five degrees from the axis of the antenna on 27 mc and 50 mc, where it is seven and fourteen ½-waves long, respectively. Even on these frequencies, the radiation from the minor lobes make it a good all-around radiator.

Center-fed antennas perform differently than end-fed antennas in several respects on even harmonics. Compare *1E* with *1B*. Whereas the currents in each half of the end-fed antenna are out of phase, they are in phase on the center-fed one. This current distribution makes the latter type of antenna act like two antennas in parallel on even harmonics, causing the most significant difference in radiation patterns on the second harmonic. Instead of the clover-leaf pattern of the end-fed antenna, it produces a sharpened version of that from a ½-wave antenna. The sharpening results in not-quite two db gain in its favored direction, compared to a ½-wave antenna,



The neat station of Dick Powell, W8IJM, who recently graduated from the Novice ranks. The transmitter ends up in a pair of 807s. The receiver is a National NC-240D. Dick is fifteen years old and in the ninth grade.

Address all letters and correspondence to 385 Johnson Street, Gary, Indiana.

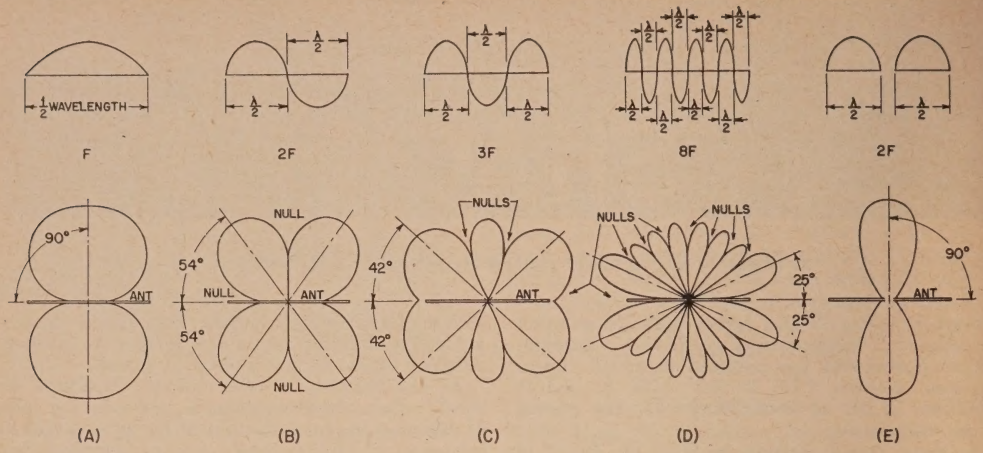


Fig. 1. Current distribution and radiation patterns of typical harmonically related and operated antennas. A to D are end-fed. E is center-fed. See text for details and application to Novice problems.

at the cost of lessened radiation in other directions.

At higher even harmonics, the pattern of a center-fed antenna resembles that of a ½-wave antenna half as long.

Another characteristic of a simple antenna is that its center impedance changes from around seventy ohms on its fundamental frequency to a very high impedance on even harmonics. This makes a doublet fed with a low-impedance feed line or a folded dipole an inefficient multi-band antenna. Either works on odd harmonics; therefore, one cut to a length of 68 feet 5 inches can be used on both 7mc and 21 mc. The folded dipole is to be preferred in this application, because it is more tolerant as to length than the doublet.

Determining The Length Of A Multi-Band Antenna

It takes no genius to discover that there is no exact harmonic relationship between frequencies in the various existing and proposed Novice h-f bands. We also know that, because of so-called "end effects," a ½-wave antenna is approximately five per cent shorter than a ½ wave in space. On the other hand, no matter how long an antenna is, it has only two ends; therefore, a long one is less affected by end effects than a short one. The general formula for calculating antenna length recognizes this fact. It is:

Length (feet) = 492 (*N*-0.05)/Freq. (mc)

Where *N* equals the number of ½-waves on the antenna.

When *N* equals 1, this formula reduces to the familar one used for calculating ½-wave antennas:

Length (feet) = 468/Freq. (mc).

By manipulating the formula, it will be found that a length of approximately 126 feet is resonant near the low-frequency end of the 3.7-mc band as a ½-wave antenna and near the high-frequency end of the 27-mc band as a seven ½-wave antenna. This length is about 9 feet too short for a two ½-wave antenna at 7.175 mc, but will be satisfactory for this frequency, because the antenna tuner will resonate the entire system—feed line and antenna—to the operating frequency.

Although this length would be usable on 21 mc, better results would be obtained by making it six ½-waves long at this frequency, or 138 feet. It might be thought that there is little to choose between the two lengths, because, while 126 feet is twelve feet too short for 21 mc, 138 feet is twelve feet too long for 3.7 mc. However, twelve feet is over a ¼-wave at 21 mc, but is less than ten per cent of ½-wave at 3.7 mc. This indicates why it is usually better to make the length of a multi-band antenna correct for the highest frequency to be used. The resulting error will be less, percentage-wise, on the lower frequencies than it would be on the higher frequencies if the procedure were reversed.

Details are given in *Fig. 2*. If there is a choice, center feed is to be preferred, because the equal loading on each conductor in the feeder will reduce line radiation. Do not fret too much about it, however, if your layout makes end feed necessary. You won't lose too much.

Antennas For Restricted Space

Three antennas, suitable for use where space is limited, are sketched in *Fig. 3*. Their operation as bent or partially-folded ½-wave antennas on certain frequencies should require no explanation, but operating *3C* in conjunction with a ground connection merits some explanation.

A grounded antenna exhibits many of the characteristics of an ungrounded one twice as long, and under proper conditions, it is an efficient radiator. The conditions are that the ground connection must have very low resistance and that the lower part of the antenna (which does most of the radiating) must be out in the clear. Neither are often met in practice; therefore, an appreciable portion of the power fed into the antenna is wasted as heat in the ground connection, and the radiated fields are subject to absorption and distortion by nearby trees, buildings and similar objects. In spite of these handicaps, some grounded antennas erected in poor locations radiate surprisingly well.

Constructional data and the theory of operation of an efficient, grounded, vertical antenna, usable on 3.7 mc and 7 mc, is described in *QST* for May, 1952. ("The Truth About The Vertical Antenna," by B. W. Griffith, W5CSU.) Particular

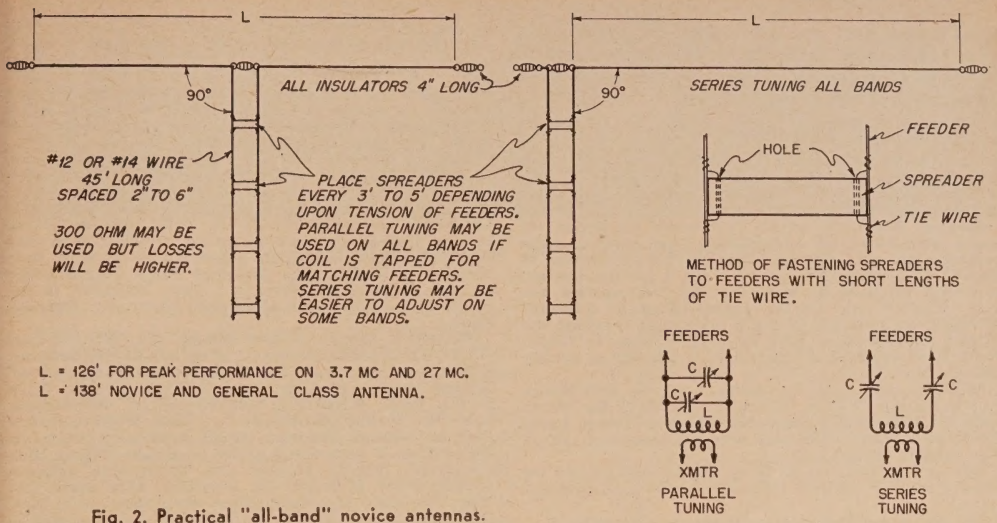


Fig. 2. Practical "all-band" novice antennas.

attention is called to the effort required to obtain a low-loss ground.

A Simple Rotary Beam For 146 Mc

Until the question of whether 21 mc or 27 mc is going to be the Novice assignment is settled, there seems to be little point in describing beams for either band. One of the 146-mc band, however, would be desirable for any occupant of the band, and the one to be described is simple enough to be duplicated by almost any Novice.

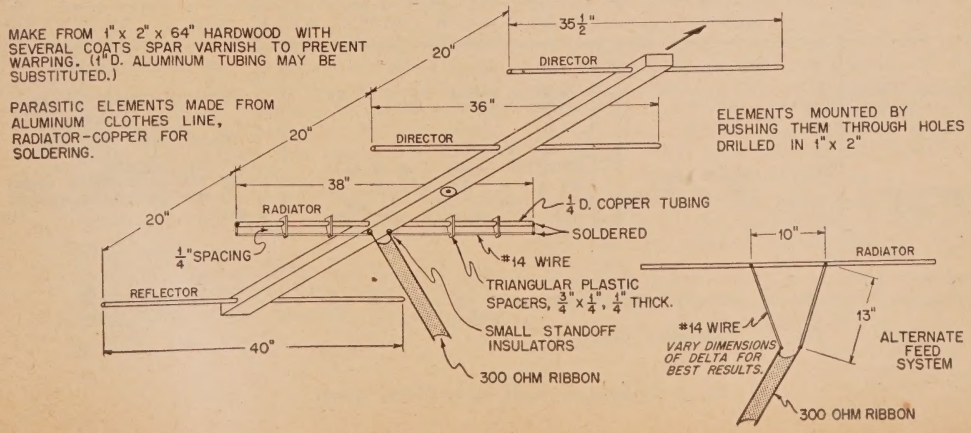
Most rotary beams consist of a ½-wave radiator and one or more parasitic elements, spaced 1/10 to 1/3 of a wavelength from the radiator. Within these spacings, a parasitic element approximately five per cent shorter than a ½-wave is a director, and one approximately five per cent longer is a reflector. The wider spacings make element lengths less critical and give slightly higher gain, when more than two elements are used, compared to closer spacings.

A good, two-element beam will increase effective power about two times, compared to a ½-wave doublet, and a four-element one will increase it up to five times. Gains of over 100 are possible with many elements in the proper configuration, but they are hardly Novice antennas. Four elements is a good compromise for a first 146-mc beam, because it gives excellent results, without excessive complications.

The dimensions in *Fig. 4* are for a frequency of 146 mc, making the beam usable over the entire Novice band. 300-ohm ribbon is used to feed the beam, because it is easier to make work reasonably well at this frequency than some other types. If it is exactly matched to the antenna, its length will have negligible effect on transmitter loading. You probably will not be that lucky; therefore trimming line length a few inches at a time may help in getting it to draw power from the transmitter. In any event, do not make the line any longer than necessary, as losses in it will decrease the effective gain of the beam.

Over normal VHF paths, receiving and transmitting antennas must use the same type of polarization for best results. Arguments over whether it should be horizontal or vertical resemble arguments over the relative beauty of blondes and red heads.

Fig. 4. The 2-meter novice antenna.



The figures cited are interesting, but prove little. The wisest thing to do is to use the polarization preferred in your area or to mount the array on a hinge; so that either may be used.

Miscellaneous

Gene, **WN4UVR**, writes, "I read Don's note about how long it takes to get a license, but he needn't worry. They told me the same thing (three to six months delay), but it only took a month and a day."

Spencer, **WN1NVN**, writes, "I received my license six weeks after taking the examination. I had made previous arrangements with Charles Wood, W2VMX, operator at W1AW, to operate that station when I got my license; so I went out there the same day. My first contract was with W1KOW on 146-mc phone. Then I contacted WN2HCZ on 3,706 kc. It was a little work cranking the normal kilowatt input used by W1AW down to fifteen watts. The rhombic antenna helped a wee bit in getting out, hi, hi.

"W2VMX said, to his knowledge, I was the first Novice ever to operate W1AW. It was a real thrill for me to make my first contacts from such a famous station. I sent WN2HCZ a W1AW QSL card with my name and call on it to confirm the contact.

"My own station consists of an SX28A receiver, 6-9 mc standby receiver, 35-watt transmitter, and a ¼-wave antenna."

(W1AW is the headquarters station of the ARRL.)

Jim, **WN9OZN**, and his station received a very fine write-up in **The Tipton (Ind.) Tribune.** Louis, **W9ESQ**, forwarded it to me, and Miss Kathleen O'Banion, Associate Editor of **The Tipton Daily Tribune**, who wrote the article, has granted permission to quote from it and use the photographs accompanying it. The photographs make it unnecessary to describe Jim's equipment, and the QSL cards prove he gets out. Antenna is end fed and 125 feet long, with one end tied in a tree. Power input averages thirty-five watts. Best DX has been 1,700 miles, and Jim's ambition is to work Rhode Island. With over 400 contacts in less than five months, its realization should not be too long delayed. Jim will then "die happy."

Ira, now **W2HMR**, suggests a box in each **Novice Shack**, containing the calls of Novices who have knocked the "N" out of their calls in the preceding month. I wonder if other readers would prefer such a special listing over the present method of making the news part of the item concerning the station. At any rate, George, **W2JGB** is ex-WN2JGB.

"As for code, I recognize this as part of their grade in my Electricity Class. In the laboratory, we have oscillators, a code machine, and three transmitters—75 watts on 4-mc phone, and two one-tubers on the 3.7-mc Novice band. Most of the studying was done at noon and after school. One stunt was for me to put W1AW's code-practice transmissions on a wire recorder, which I brought to school for the boys to copy."

Brother Louis, **W3RZZ**, writes, "At West Catholic High (Philadelphia, Pa.), we have a radio club. Five of the members, WN3PTA, WN3TPB, WN3TPC, WN3TPN, and WN3TPP, have obtained their Novice licenses. One, Frank Thornton, age 14, has earned his General-Class license. We will also send ten more boys down next week for their Novice and Technician licenses.

"Six of the boys have good receivers, because other hams have given them nice prices on their used receivers, and they want the old-timers to know that they appreciate this.

"I think the boys deserve a lot of credit, because they come in for lessons at 8:00 AM, which is one hour before school starts. This means a lot, because half of them travel to the city from the suburbs."

W1NOA is responsible for the following items. Steve, WN1TUC, and Freq., WN1UHU, son of W1UJS, are members of the Stamford, Conn., AREC. Steve saw experience with the AREC in a recent surprise CD drill. Both would be eligible to operate one of the club's nineteen 146-mc mobiles if they were not too young to obtain a driver's license, being Junior High School pupils. One of their teachers is W1PCZ. The Stamford Radio Club is proud of their youngest members. . . . Paul, WN1USF, is secretary of the Radio Club of Fairfield University, Fairfield, Conn.

WNØHFY reports a new Novice net. WØDYD and WNØGHX are net controls. It meets a 3:00 PM Saturday and Sunday and 5:00 PM Tuesday and Thursday. All Novices around Minnesota are welcome to join. Write to Bill Blass, WNØHFY, 3309 Abbott, N., Robbinsdale, Minn., for further information. . . . Ladd, **W9CYD**, reports that the Chicago Suburban Radio Association meets the first Friday of each month at the Broadview Village Hall, Broadview, Illinois. Novices and Technicians welcome. Contact Peter P. Forst, Jr., Secretary, 2016 South 11th Ave., Maywood, Ill., for further information. . . . Dick, **WN8IJM**, is now W8IJM. He is fifteen years old, and in the ninth grade. He worked forty-one states on the 3.7-mc band with sixty watts input and a ½-wave antenna fifteen feet high. Present transmitter ends up with a pair of 807's completely shielded, with built-in low-pass filter, and is TVI-proof, feeding an all-band, center-fed antenna, 136 feet long.

Two beginners who would like the assistance of someone in their localities in obtaining Novice licenses are, Peter Stanck, 9355 S. Peoria St., Chicago 20, Ill., Telephone, Hilltop 5-0314, and Gerald Bakke, 3801 Proctor St., Flint, Michigan.

Questions From Novices

Q. Can you suggest a method of improving the keying of TBS-50 transmitters?—WN4VIV

A. Disconnect the end of RFC1, oscillator cathode r.f. choke, from the keying line and connect it to chassis ground. This change will permit the oscillator to run as long as plate voltage is applied to the transmitter, which will improve keying, but will prevent working "break in." A SPDT toggle switch may be installed, to permit choice of either connection.

Q. How can I improve the selectivity of my 3-6 mc "Command" receiver?

A. Connect a 1-10 $\mu\mu$f trimmer condenser between the grid and plate terminals **(pins 8 and 4)** of the first i.f. tube to introduce regeneration in the i.f. amplifier. Adjust its value; so that the stage breaks into sustained oscillation, indicated by a steady whistle from the phones with the BFO on, with the gain control near maximum. Setting the gain control just below the oscillation point will increase selectivity considerably. Touch up i-f tuning after adding capacity.

Keep the letters and pictures coming. See you next month.—Herb.

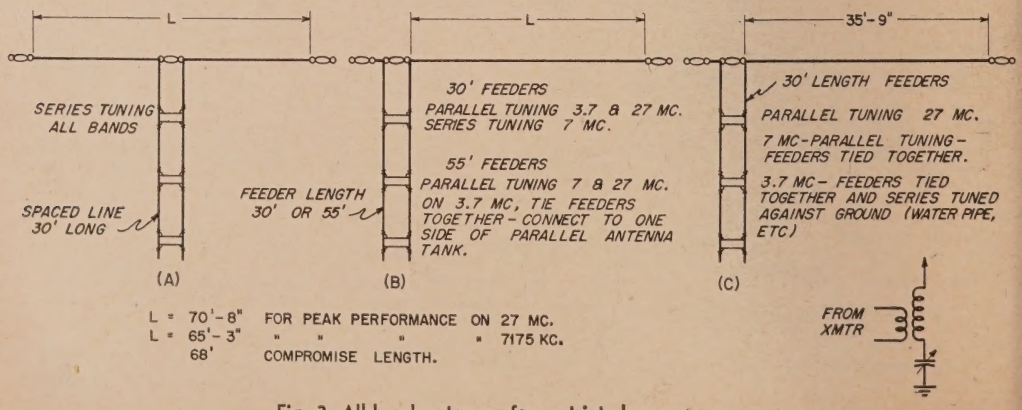
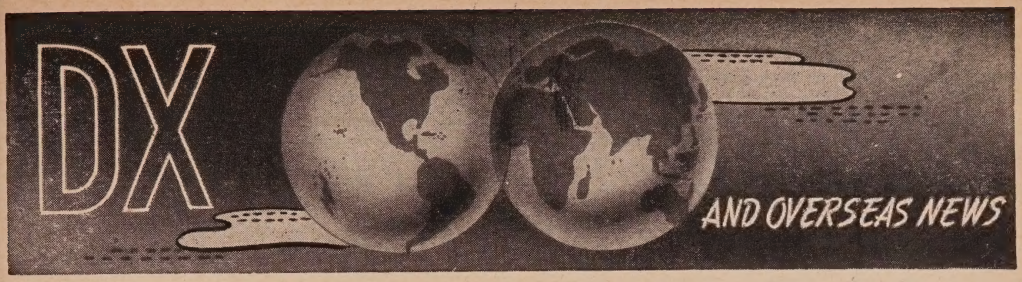


Fig. 3. All-band antennas for restricted space.



Gathered by DICK SPENCELEY, KV4AA*

The first week of 21 mc activity has given us a rough idea of the characteristics and capabilities of this new ham band. 21 mc seems particularly sensitive to propagation variations on a daily basis but promises to be one of our best DX bands when conditions begin their upward climb from the present bottom of the solar cycle. A similarity was noted between present conditions on 21 and those of 28 a couple of years back. Results depend entirely on openings which, to date, have been mostly of the north/south variety. East/west openings are predicted later in the year. Of course, there will be many times when 21 mc will be "normal" where anything can happen, and probably will. Perhaps a resume of actual activity during the first ten day period will tend to give a clearer picture.

May 1st:

At KV4AA a watch was maintained from 1200/2400z. First QSO came at 1523 with PY5XX. This was followed, later on, by contacts with TI2RC, KV4AI, YP1AJ and PY2CK. Not a single W was heard but the DX ends of the following QSO's were copied: CE3AX/W6MYC — W7HXG — W6TDZ — W6YRA — YN1AA, TI2RC/W6DFY and PY2CK/W6TZD. . . . At KT1OC, where Hank maintained a 24 hour vigil, no signals were heard until 1248z when contact was made with I1CUC. This was followed, until 1856z, by QSO's with EA4CN, HZ1MY, OZ5K, DL3SP, DL7AP, KT1UX, OZ7SN, PY2AQ and PY6AK. Heard were: YU1AG, 4X4FN, PY5XX, ZE3JJ and PY1AHL.

May 2nd:

This day the band did an abrupt flopover with openings between KV4 and everything from W1 and W6 to VE4 with signals averaging S8. Between 1645 and 0055z 90 contacts were made with KV4AA being a "first" for W1DF, W2AJP, W4IYI, W8NOH, K4AF, W2EUI, W8FVZ, W3JEW, W3AJP, W9NZZ, W4ANK, W4AEP, W2SCO and W5RMJ. At 0117/38z VK4HR, VK4SN and ZL1BY were contacted. It was heartening to see the number of stations that had hopped on the 21 mc bandwagon and to note that everyone from ten watts (W3UX) up were putting in fine signals with a variety of antennas ranging from long wires to 2 meter beams (plus feedline).

May 3rd:

Things slumped a bit but contacts were made with CE3AX, KH6YL, X8EE, WØCXY, W6FUF, W6GTI, W6DFY W6CYI and HP1BR.

May 4th:

Conditions were back on a May 2nd basis with 59 W contacts being made followed by a ZL1HY QSO at 0107z. From here on in to May 10th the band settled down a bit with fairly consistant W openings. Only DX of note was OQ5RA and OQ5BQ who both put good signals over the east coast area. KV4AA wound up this period with 224 contacts and 15 countries.

The PY area appeared to be in a better position for overseas contacts with PY4IE rounding out an early WAC with OD5AB, OA4AP, HB9FU, OQ5BR ZL1BL and W6DGJ. Milton also reports the following active hams: HP1AW, HC1RE, ZP4AB, MI3ZX, MI3SL, CX1IV, CX3IZ KH6ANZ, CX2AQ and ZD9AA. . . . G3FXA reports 21 mc will be officially opened for G stations on July 1st. Don't forget to head your beams that way at that date. . . . From GM3CSM we hear that Ian has logged the following 21: PY, KP4, KV4, KG4, VE1, OQ5, TA2EFA and W1AXA, thus, the European path is not entirely out!!



Needing no introduction to the DX fraternity are (in the usual order), F8BW, F8BS and F9LQ.

From LU land we are sorry to hear that the Argentine hams do not expect to be granted use of 21 mc this year. . . . W5AVF reports ZK2AA and VR2CG heard on 21. . . . W1MB's initial post-war contacts on 21, 3.5 and 50 mc have all been with W1BB!!

At Time of Writing

EA9DC/IFNI—The long awaited EA8AW jaunt to Ifni and Rio de Oro materialized on May 11th at 2000 when Crescencio came on the air. This has

**A monthly department. Address all correspondence to R. C. Spenceley, Box 403, St. Thomas, Virgin Islands. U.S. Air Mail rates apply.*

precipitated one of the most gosh awful struggles of kilowatts that we have seen in some time. After spending some time handing out phone QSO's on 14310, EA9DC, who is fundamentally a phone man, must be given a big vote of thanks for allotting generous portions of his time to CW operation. Fortunately conditions took one of their rare turns for the better on 14065 during the 2200/0300 GMT period and QSO's were noted with the following lucky ones: W8HGW, W4CEN, W6VFR, W8ELL, W3CRA, W6DGJ, W3EPV, W9KFC, W9FID, WØYXO, W3BXE, W3CTJ, W6WQ, W6DFY, W6PFD, W6AM, W6SC, W3EVW, W7AH, W2AGW and W2CTO, to mention a few. Cards should be sent to EA8AW, Box 346, Las Palmas, Canary Islands, and, according to XE1AC, a dollar should be enclosed for those wishing an air-mail reply. Crescencios' next camel stop is Rio de Oro. See QTH's.

Endorsements to Honor Roll appearing in June issue:

W1FH	40-248	W8SYC	39-207
W3BES	40-243	W8WWU	39-157
W6ENV	40-241	W5KUJ	38-177
W6AM	40-235	WØTKX	38-174
W3EVW	40-232	OH3OE	37-112
W7BD	40-214	W5FXN	35-146
W6TI	40-207	ZL3CP	35-117
DL7AA	40-204	PHONE ONLY	
WØELA	40-201	XE1AC	39-215
W5ASG	39-229	W6AM	38-163
XE1AC	39-223	W1NWO	36-192

Next complete Honor Roll appears in the September issue.

ZC2MAC/COCOS, VS7MC/G3CRY, ex VP9K, is another one who has been giving the gang one of those hard to get places. Mac is usually on the lower treqs of 20 around 1330/1530 GMT. and will be active until mid-August. No QSLs will be forthcoming until he returns to Ceylon and we understand cards should go via RSGB. Mac runs 40/50 watts to a long wire and the recvr is AR88. QSO's to date have been noted with the following: W6ENV, W6VFR, T12TG, W6AMA, W6PFD, W7BD, W6PFD, KZ5WZ, W6KYG, W6DLY, W6FSJ, W6AM, W5ADZ and W5ENE. Operational schedules may be obtained by QSO with VS7NG.

HZ1MY/SAUDI ARABIA, W6MLY/KL7JDG/XE3-MY/W4DVL/WØMLY, came on the air April 19th and in six days racked up 362 contacts in 85 countries and 32 zones with his 32V2/75A2 setup on all bands. This is a station to watch as, during his two year stay, Dick plans operation from the following 'hot spots': YA, FL8, YI, CR8, VQ6, Yemen (4W1) and the kingdom of Qutar. QRO to 500 watts is planned for the near future. All QSLs should go forward via air-mail and envelope. See QTH column.

Another station should be active at ZC2 (Cocos) about June 1st, according to info received from W7BD through a VS1CZ QSO. Ken, VS1CZ, advises that this gent will arrive at Cocos on May 25th and will be active on both CW and phone. VS1CZ will take care of his QSLs and will maintain skeds on 14062. . . . From Wally, W1HE, we are advised the BAF Scott Glacier Expedition, Bay of Whales, Antarctica, will be on 14 CW after July 20th. . . . FP8AI and FP8AJ, St. Pierre & Miquelon, will be active this summer in the persons of VE3BJD and VE3CCK respectively. . . . W5AVF reports VK9GM, Norfolk Island (Separate country), is active daily on 7011 from 0600 to 0800z. . . . From G3IDC we hear that Geoff, SU1OG, is now putting in some time as JY1OG, Jordan, 14070. . . . TI2TG advises that VR1F should be on at VR4DF now. After a few months VR4DF will appear in VR6, Pitcairn, and then go on to VR7. . . . I1AIV states there will be legitimate ham activity in Vatican City, HV, within a very few days (May 19). Let's hope that this is now a fact.

Here are a few items via G6QB, Short Wave Mag: The former AP2Z is now home. If any QSLs went astray drop him a line. See QTHS. . . . Geoff, ex VU2GH/AP4A, has taken over the AP2Z rig and will be active in Karachi. . . . VP8AJ is ex G3AXN, he runs 350 watts CW and 250 phone. . . . ZC4RR is a new one in Cyprus. . . . VS1EV confirms his intentions to operate from VS4 when license is received and goes on to say that VU5AB, Nicobars, is genuine and QSL's but he is on 7 mc CW only and at infrequent intervals. . . There are 18 active stations in VS1 at present.

Here and There

From **VK4QL** we hear that VK2QZ, who has been operating /VK9 should show up in VR4 land very shortly. . . . **W1ABA** is on again, with Viking, after a layoff since spark days. . . . **VE1DG** in now VE3CNC. . . . **W4CG/KV4** is now KV4BB, see QTHS. . . . **4X4CJ** assists F7AS and F7BR in army communications work W8PQQ . . . SM5AXC and three SM aircraft men visited W6AM. Don should now be back from his European jaunt. . . .

VK/ZL CONTEST 1952

WHEN: 1200 GMT Sat. Oct. 4th to 1200 GMT Sun. Oct. 5th for CW. 1200 GMT Sat. Oct. 11th to 1200 GMT Sun. Oct. 12th for Phone.

SCORING: One point for each contact with any VK/ZL disrtict on a specific band. Final score: Contact points multiplied by VK/ZL districts worked on all bands.

SERIAL NRS: Six numeral (Five for phone) RST plus 001 for first contact, on up.

LOGS: Separate sheet for each band, should reach NZART, Box 489, Wellington, N. Z. on or before Jan. 23rd, 1953. Mark envelope "VK/ZL Test."

LISTENERS SECTION: (For SWL's) — Logs must show station calling and called, RST and serial number sent by calling station. Same scoring applies.

DL7AB advises that GM3HGA, Shetland Islands, is a substitute for the un-QSO-able UA1 on Franz Josef Land. This is for the WAE certificate. . . . Rudi, **DL7AB**, suggests substitute stations, such as have been established for WAE, be made for WAZ so that UA may be bypassed. H-m-m-m. . . . **W3ENK/KG6** advises that W3ENK went off the air on Jan. 31st. Since April 10th Chas. has been active in Guam. 95% activity is planned on 14 CW. See QTHs. . . . From **ZL2LB** we hear that VR5GA is now ZL1AJL. . . . Larry, **W9IOP**, (W2IOP and W8IOP) has received his 75 ft. tower and should be going strong by the time this is read. . . . **W3LE** bemoans his poor QSL average, 165 for 206, and seeks pasteboards from CR4AC, VQ4HU, FB8BB, CR6AN, ZD9AA, ZD6AC, VS2AA, VS9AO, VU7AH, FO8AC, VS9MA, VR1D, VR2BJ, KM6-AV, VK9YT, AC3PT, VQ8CB, VR5GA, MT2E, MD2PJ, XZ2KN and VR1C. You have lots of company in this situation Lou and I guess the only solution is to locate them and wear them out via mail. . . . **W6AM** advises that MOLUCCA is a new republic. Their stamps appeared in USA in April. The question arises, is this one separate from Celebes and do present FCC restrictions hold as applied to Indonesia? A subsequent QSO with **W1RWS**

tells us that the FCC would have to pass on this one. . . . After two hours of aerial gymnastics **W6KIP** located a busted bolt on his beam dipole. . . . **W3EVW** shattered his elbow as a result of a fall while repairing beam. Roger is doing nicely now and advises he received his CR5UP card by writing to W4PJU and enclosing stamped envelope. . . . **W2ESO** believes we should give a big hand to those DX spots who immediately QSL, such as IS1AHK and EA9AP, we concur. . . . **PK4DA** gave a very interesting talk to 46 DXers recently at a No. Calif. DX club meeting. Arie has worked 40 zones on phone, but, that's right, all confirmations not yet in. . . . **W6AM** advises that with the J peace treaty Japanese nationals can, no doubt, be legitimately worked and should be given all encouragement. . . . **KV4BB** visited KV4AA. As a result AA now has a pair of 4-125A's and other QRO gear. Hold your hats boys!! . . . **W2AGW** chatted with W6QD and W6LS on recent West Coast trip. . . . In a meeting of the West Gulf DX Club at Shreveport, La., April 26th, the following officers were elected: Pres. Bob Wagner, W5KUC. V. Pres: Al Wingate, W5CEW. Secy: Marion Wagner, W5UCQ. Treas: Jim Price, W5FXN. The policy committee consists of W5KUC, W5CEW, W5ASG, W5EGK, W5ENE, W5KC and W5MIS. . . . Ned, **FM7WE** (FM8AD) returns to FM in August or September according to a QSO with Ned at F9QU.

WAIP AWARD (Worked all Italian Provinces)

This certificate is sponsored by "Radio Club Amatori" Box 172, Ravenna, Italy. Applicants must show confirmation of contacts with sixty of the existing ninety three Italian Provinces under the prefixes of I1, IS1, IT1, MF2 or AG2. Contacts must be made after Jan. 2, 1949.

Deeds and Doings

W8YIN nabbed YU1CX, VK6LU, EA8BF, TF3MB, ZE3JP, VK9XK and GC 4LI 7 & 14 mc. . . . **W8SYC** QSO'd ZP1TB and LZ1KAB (ops LZ1DP, LZ1MN and LZ2PI on hand) while adding QSLs from ZM6AK, ZS2MI, VQ1RF, YI3BZL and VP8AP. Clint is now 207 . . . **W3IL** added OQ5RA. . . . **YV5AE** rises with KC6QY, KX6AS and KW6AW. . . . **W5ASG** goes to 229 with KC6DX (eastern Carolines) and the split package VS1/2 deal. . . . **W5AVF** hooked TG9AQ who promises to be more active. . . . **ZK1BC** and **KV4AA** hooked KS6AA together, thanks to KH6WU. KS6AA leaves on June 20th according to W6TXL. . . **W1FH** is adding everything that comes along such as EA9DC etc. his present total is hazy now as our adding machine blew up. . . . **W5FXN** reaches 146 with VP8AJ, EL7A, EAØAB and VQ1RF while **KG4AF** nabbed ZC1CCT and HB1HY/HE. . . . **W4EXO** ponders QSO with one PX2AE who says QSL via ARRL. . . . **KV4AU** adds FKS8BC and 5A2TS. . . . A card from **ZD9AA** made it an even 200 for SM5LL. Nice going Hilding. . . . **DL7AA** goes to 206 with such as YA3UU FL8BC CM6AH and VK1WO while XE1AC goes to 215, phone only, with VS2AL. . . . **OH3OE** reaches a modest 112 with VQ3BM, KW6BB, FN8AD, MI3LK and EA9AP while **W1NWO** hits 192. A3 only, with EA9DC, CR4AF and ZK2AA. . . . **ZL3CP** adds a new zone, VK1PN, and CR9AF, YN1AA and KH6QY/-KC6, atta boy Chas. . . . Two 'firsts' on 160 are W2QHH/-VP4LZ and G2YY/ZC4 QSO's. . . . **W5KUJ** reaches 177 with VS2CP and FD8AB. Chas. also welcomes cards from ZD6DU YI3BZL ST2GL and EAØAB. . . . **W6COH** warmed up the five watter and brought in VK3GA, ZS5LA, LU1QB and TI2CR. . . . **W8WWU** adds EZ4BB/9S4 and VS1CW for 157. . . . Bob, **WØTKX** accents his steady rise with EA9DRC VK2QZ/9 HE9LAA ZC4DT LZ1KAB ZD9AA and others. . . **W4KE** submits a recent all-band list which includes VP7NM, KH6PM ZL1HM on eighty, YO2BC, FA8BG, EA1AB, EA8BF, YV5DE on forty and GC4LI, AG2AG, OA5A, ZE3JP, KT1OC on twenty. Eleven accounted for KH6ABF while ten yielded LU3EL and KH6IJ. . . . **W4TRP** came thru with 9S4AX, 5A2TO, HB9NL, OZ8BB and F7AT giving Bob 57 for 7 months hamming. . . . **F8BS** adds PY1YR VK9XK. Pierre advised patience and all will receive their FB8ZZ pasteboards.. . . **W6TI** adds a VS1/2 and ZM2MAC which brings Horace to 207. . . . For **W8ZBD** we say that TA2EFA is quite OK. The volumn of QSLing he has to do probably slows him up Chas. . . . **W9FID** makes it 198 confirmed with crds from VQ1RF VP8AU and VP2GH . . . **W2CTO** recd crd from ZP2AC thereby finally rounding out So. America.

Isreali Award (c/o 4X4BX)

This award is issued to stations who have contacted 16 different 4X4 stations on the following bands: 3.5, 7, 14 or 28 mc. (21 mc?) At least one 4X4 must be worked on each band mentioned.

On QSL's

W1NWO, who handles cards for 9S4AX, wishes it to be known that 9S4AX will not send QSLs to W's before receipt of their cards. If cards are sent via W1NWO they will be acknowledged promptly. . . . Through a misunderstanding we mentioned **WØYXO** in connection with **ZK2AA** QSL's. We quote a reply from Ken: "I do not now nor have I at any time in the past had ZK2AA's log nor any arrangement with him to act as an receiving station for cards addressed to ZK2AA. The notice which appeared a year or so ago to 'QSL via WØYXO' was not authorized by either ZK2AA or WØYXO." We hope this will set things straight. . . . **W5AVF** advises that ZM6AK (ZL1FT) has received a supply of cards via W6JZP and by this time most of you should be in possession of the long awaited ZM6 pasteboards. Norm writes that the ZM6 administration froze all stationery due to paper shortage (raw-ther embarrassing at times—wot!!) and, while regretting the unavoidable delay, feels that the ZM6 QSO's were the important thing and QSL'ing could be always taken care of later. . . . In response to our query the following stations have advised that they would be happy to handle QSL's for stations on DX spots who find it difficult, for one reason or another, to acknowledge their contacts via QSL card. We urge such stations to get in touch with one of the following: **W4AZK, W3LE, W9NN, W4TRP** or **W5WI**. . . . **W4RBQ** has recd a QSL from JAØIJ (Iwo) who is now stateside. See QTH's.



Snapped by SM5ANY at the SSA QSL Bureau we see the origin of such husky signals as (l. to r.), SM5ARL, SM5AFU, SM5AQW, SM5AQV and SM5AOI.

QTH COLUMN

EA9DC (Ifni/Rio de Oro) EA8AW, Box 346, Las Palmas, Canary Islands.
CR4AI Jose, Sal Island, Cape Verde.
ZC2MAC (G3CRY VS7MC) Via RSGB.
JAØIJ W4QCA, R.W.Cook, 146/1 Prichard, Ft. Knox, Ky.
ZC1CCT Via RSGB.
EA9BF and EA9BD Box 38, Tetuan, Sp. Morrocco.

(Continued on page 62)

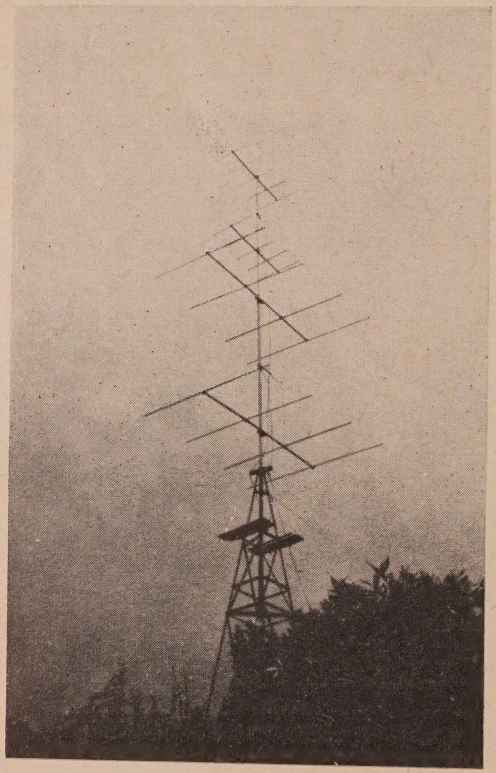
the VHF news

Edited by
W. E. "BILL" McNATT, W9NFK*

Two Meter Auroral Propagation, April 29—May 3

W2NLY, South Plainfield, New Jersey, worked W9UCH, Fort Wayne, Indiana; W8BAN, Jackson, Michigan; and W2ORI, Lockport, New York, on the April 29th auroral opening. W2UHI, W9EHX (McLean, Illinois, over *800* miles), W2YXE, W2SPU, W2OPQ, W2SFK, W1BCN and W1IZY were heard by Jim. W8ZUR/8, Springfield, Ohio, heard W2SFK and W2NLY at about 9:30 p.m., EST.

On April 30, W2AZL, Plainfield, New Jersey, W2OPQ; Hagaman, New York, and W2PV, East Greenbush, New York, all worked W9UCH.



VK6BO uses the basic "twin-five" W2PAU array on 2-meters. This antenna made the contact between VK6BO and VK5GL on December 30, 1951 at a distance of about 1330 miles.

W8ZUR/8, Springfield, Ohio, on May 1st, worked W1IZY, Middleboro, Massachusetts, and W8FRN, Jonesville, Michigan. Ed also heard W2ORI; W3RUE, Pittsburgh, Pennsylvania, and W2OPQ. This activity was between 9:00 and 10:30 p.m., EST.

On May 2, Jim Kmosko, W2NLY, heard W1IZY, W9UCH and W9SUV, but his calls were in vain. Aurora prevailed again on May 3. W2NLY worked W9EHX; W8RMH, Detroit, Michigan; W8BGY, St. Clair Shores, Michigan; W4AO, Falls Church, Virginia; and W3LWN, Sigel, Pennsylvania. W9UCH was heard, S8 on peaks; also, W9FB?, W2ORI, W3KWL, W3RUE, W1IZY, W2SFK, W8DX, W8GAB, W2OPQ, W2YXE, W2AZL and W2UK.

W2NLY comments, "W9EHX was S5 a good part of the entire opening from 5:45 to 8:00 p.m., EDST. If only more W9s and WØs had been on, I'm sure they might have had east coast contacts. . . . Aurora signals seem stronger during daylight hours, or at dusk. So, getting on the band at an early hour—and taking the XYL out, later—might pay off!"

Six Meters

Coincident with the 2-meter auroral opening, the 6-meter band also came to life. **W6BWG**, San Gabriel, California, reports that one-hop skip occurred between southern California and Texas on April 29. At about 1400 PDST, Wes heard W6QUK, San Bernardino, working W5SFW, Amarillo, Texas. Phil's signals were Q5, S9 plus about 10 db. W6BWG promptly fired up and raised W5MJD, Amarillo, at 1410 PDST; Joe's signals were about the same as W5SFW, with some QSB noted, until about 10 minutes later when the band folded. No other signals, local or otherwise, were heard.

W7HEA, Toppenish, Washington, reports, "The first six-meter opening of the year came (here) on April 30 at about 0730 to 0815, with no one on at the other end, so no contacts were made. Harmonics of commercials around San Francisco bay were in up to 50.8 mc, and the commercials below 50 mc were S9 plus. I couldn't raise a thing on 6, though!

"On May 3, at 2011, W7FGG, Tucson, Arizona, broke through for the first contact of the year. Jerry's signal was over S9 at times. He faded out, and at 2050 W6ABN started coming through, followed soon afterward by W6OB. Signals were not as good as W7FGG, peaking at about an S7. The band folded at 2109. On May 11, about 2000, the f.s.k. RTTY on about 49.9 mc from Alaska was heard for the first time this season; sure wish someone was on, up there."

W4MS, Pensacola, Florida, informs us that active 6-meter stations there are W4FHQ, W4UCY, W4PQW, W9CGO/4, and W4MS. Eddie's QSOs for May were W5LFH, May 4th; on the 8th, W2ZUW and W5LIU; W9EWO and W9MHP on the 11th; W1HDQ on May 13. On the 14th, W8CMS, W3RUE and WØTJF, who was worked for one hour because no other signals were heard between 2218 and 2318 CST! W5LIU was worked again on the 15th; W5SFW and W5LFH on the 16th; W9FJB, Winnetka, Illinois, on the 17th. May 18th paid off very

*Address all letters and correspondence to 2515 LaBranch, Houston, Texas.

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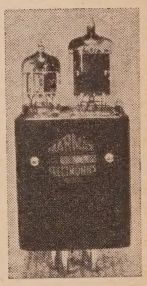


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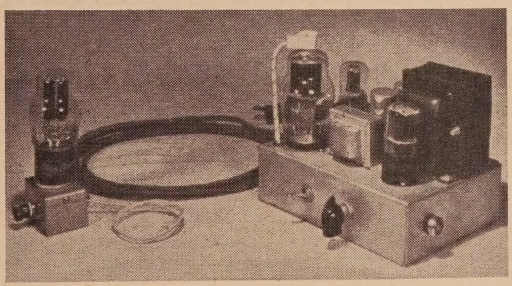
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nicely with contacts to W8CMS, VE3AET, Lansing, VE3AZV, Oshawa, VE3ATE, Toronto, and VE3DKW, Hampton, Ontario. On May 13, when W1HDQ was worked, W4MS also heard the VE9 beacon; on the 14th, Eddie heard WWV transmitting "N" on 30 mc when he worked W8CMS and W3RUE. W4MS VHF DX Scoreboard total is 40 states, 5 countries.

W8BLN, North Hampton, Ohio, is now on 6 meters, according to W8WRN, Columbus, who has been making tests with him. He uses a 6J6-832A transmitter and a 4-element beam. W8CPA plans to have a 6-meter mobile rig in service by now. He travels a great part of the time and works on the rig on the overnight stays.

Australian Two-Meter News

Letter from VK6BO

"As one of the operators in the VK5GL—VK-6BO mc QSO mentioned in your 'VHF News' March, 1952, may I thank you for recording the contact?

"I would like to pay due tribute, however, to W2PAU because the beam here was based on his 'Twin Fives.' Element diameters were different, etc., but it was his article in *CQ* that was responsible for the spacing.

"The top set of elements is 53 feet above ground. (See photo.) The twin fives are above a 50 mc 4-over-4 array. The 144 mc array is fed through 120 feet of 300-ohm flat ribbon with a shorted matching stub. The two arrays are independent.

"You will probably be interested to know that on February 9th I again contacted VK5GL and also VK5QR. VK5QR and I had tried over twelve months before to break through, so I was very pleased to contact him. The band was open for well over half an hour, to my knowledge.

"To work through to Adelaide, I have to shoot over a 1000 ft. range (of mountains) 5 or 6 miles away.

"The distance of the contact between VK2AH and ZL3AR, on 144 mc, is within a mile or two of the VK5GL—VK6BO distance.

"As a matter of interest, the transmitter here is EL32 oscillator, EL32 tripler, 6AQ5 doubler, 832 trippler to 815 p.a. running 45 watts input. The receiver is a 6J6 p.p. neutralized triode r.f. stage, RL7-RL7 cascode r.f. CV6 triode mixer, CV6 oscillator (132.5—136.5 mc), 6SH7 i.f. at 11.5 mc, 6J8 mixer to 455 kc, 6G8G i.f. and a.v.c., 6H6 detector—noise limiter, 6SN7 cascade a.f. to 5" speaker; 6J5 b.f.o.

"I am looking forward to the next DX season on both 50 mc and 144 mc, and hope to make a few extra contacts on 144 mc.

"I trust that you will be kind enough to pass on my thanks and my appreciation to W2PAU, and I am enclosing a photo of the array so that he . . . and you can see what it looks like, on top of the 4-over-4 array on 50 mc.—73, Rolo, VK6BO."

(*VHF Ed.* Note: Thanks, Rolo, for a very nice letter. We all appreciate it, and hope that you can find time to keep us up to date on v.h.f. activity in your country!)

220 Mc—420 Mc Activity Increases

On April 19, the first Hamilton—Toronto contact on 420 mc occurred when VE3AQG, Hamilton, worked VE3AIB, Toronto, crossband to 2-meters, according to VE3DER. Iris says that Sid, VE3AQG, unfortunately didn't have his 420 mc. receiver working. It is expected that the 6J6 converter will be working soon, however. Hi!

Since the initial QSO with VE3AQG, several Hamilton contacts have been made. VE3DAN worked VE3DAL/3, Hamilton, but—thus far—VE3DAL, at his home location, hasn't been able to get through from below the Hamilton "mountain." VE3AXT, VE3BQN, Toronto, W2ORI, Lockport, and W2PSG, Lewiston, New York, have also been active on 420 mc, VE3DER concludes. Please send your reports of activity to Mrs. Iris F. Weir, 209 Yarmouth Road, Toronto, 4, Ontario. Although the Weirs are moving and no report is expected, again, until August, that address will be satisfactory until the new one is announced.

W2QED, Seabrook, New Jersey, became a proud father for the second time when his second daughter arrived on April 25th at 5 a.m. with a net weight of seven pounds! "That's the main reason that 420 mc activity at W2QED was so low," says Ken.

During the time available for activity, however, W2QED reports that conditions generally were much better than they had been for several months. "As you can see by my contacts with W3BSV, the only schedule kept regularly, the signal strength over the eighty mile path remained high through the entire month. It probably dropped to winter-time average during the final week, as we had seven straight days of rain—but, those included the nights I spent with the XYL at the hospital, so I have no data except for the contact with W2BLV on the 26th when conditions were poor, even at 25 miles.

According to W2QED, news from other 420 mc stations indicates that much improvement of equipment is being made, probably because of the expectation of summertime DX. "Some serious attempts to break the 420 mc record will be made, I imagine," says Ken.

W2EH, Collingswood, New Jersey, now has a new 40-element bem. W3RKQ will have a new crystal-controlled transmitter on 420 mc, using an AX-9903 in the tripler and the final. His former rig, an AX-9903 tripler-final will be used by W2HEK who is polishing off a new converter using 6J4 r.f. stages andd a 1N21B crystal mixer with a 955 oscillator. The output stage is on 2 meters so that the 2-meter receiver can be used as an i.f.—audio system. W3OWW finally showed up on 2 meters again with an entirely new rig; he says he is rebuilding the 420 mc gear, according to W2QED.



How about this rare one for the wall?

W5FEK, Houston, Texas, says that 220 mc activity is getting more play, all the time. . . . **W5ONS**, Victoria, Texas, heard W5AJG, Dallas, for the first time on the morning of May 9th. LeRoy was putting in an R5, S7 signal over the 275 mile path, but had no way to modulate it. . . . **W5FSC**, Houston, has his beams for 50, 144 and 220 mc now up to 70 feet and worked 220 mc duplex into Austin with W5BDT and W5AXY on the morning of May 15. Bud has a measured gain, against a reference standard, of 2 and one-half S-units, on the array at 70 feet as against the old set-up at 30 feet. . . . **W5ON**, Houston, **W5UB**, San Antonio, and **W5IVU**, Edna, are planning equipment.

W8WRN, Columbus, Ohio, reports that it looks like 220 mc is really coming into its own in his area. W8WRN now has a 12-element beam about 40 feet in the air. The AX-9903 final is now operating with about 50 watts input; the converter has been improved. . . . Jerry, **W8WJC**, is completing the new super-duper 220 mc antenna, and has the p.p. 4-65As operating at 300 watts input. On May 4, according to W8WJC, a roundtable of 5 stations on 200 mc was active in the Cleveland area, including W8WM. . . . **Flash**—W8UKS is back on v.h.f.! Yep, Sam is on 220 mc with a pair of 826s, according to W8WRN. He's expected to be back on 2 meters, also; took down the "d.c." antennas in early May. So, look out, cautions W8WRN, "That boy really gives all he's got to the band of his choice, that's for sure!" (**Ed. Note:** About 4 or 5 years ago, "Ukus"—W8UKS—was a fervent, active 2-meter man whose immense devotion to the band made him known all over the country. Sam's return to v.h.f. is indeed encouraging.)

W8DQR, Toledo, W8DX, Detroit, and W8CPA, Columbus, are all expected on 220 mc soon. As for 420 mc, W8WRN says that he still has to get a good receiver going; W8CPA is also working on equipment. W8UYL/8 promises to bring his 420 mc gear from his Canton home,

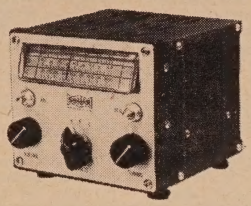
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6AT6 1st audio
6AQ5 audio output
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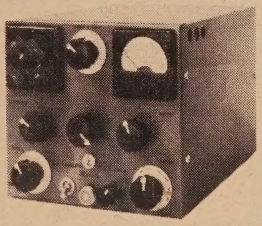
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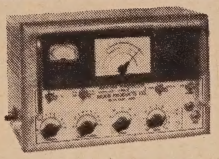
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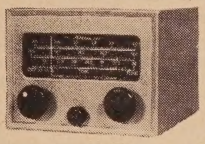


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W9TQ's Badger Milk Run

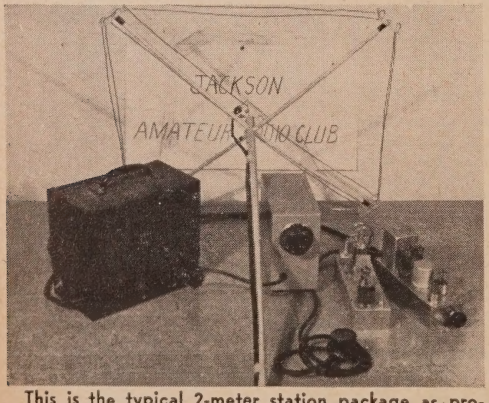
Conditions and activity on two meters have both improved in the Milwaukee, Wisconsin, area. The increase seemed to start during the second week of April. More Novices are on and are busy with two meters. Each and every one of them are most welcome and are heartily greeted by the "regulars."

WN9OOW is now using an 829B final and a new modulator as a result of some rebuilding; he is also working on a new converter. . . . **WN9RNI** finally got on, and is improving the power supply; he hears more than he works. . . . **WN9RNJ** is selling some equipment, but is keeping enough for his new QTH in Florida. . . . **WN9RXI** has a final signal. . . . **WN9QME** has been heard; nothing from WN9RTU and WN9RYV, so far. From Illinois, we have **WN9OKF** (Leo, "You Can't Stop Me," Heuer) and **WN9REM** worked; fair results on the schedule with WN9OKF. . . . **W9NVK**, Racine, has worked many WN9s in Illinois.

W9AFT, Milwaukee, is expected to be on with the new beam and the tower, according to WN9RNJ. . . . **W9BTI** is busy with 144 mc mobile. . . . **W9LPF** is to be on, again, with a new beam and a new tower, per W9AFT. . . . **W9GIP** is to have an outside beam. . . . **W9BTQ** QRL at the "saltmine." **W9DDG**, Sheboygan, is also QRL with the "green thumb" (gardening) project. . . . **W9FAN** isn't satisfied with his clipper circuit. . . . **W9LUQ** had troubles. . . . **W9NVK** deserves credit for representing Racine on the two-meter map. (**VHF Ed. Note:** That Racine gang once was prominent on vhf!) **W9UJM**, Hales Corners, Wisconsin, is feeling better, now, we're glad to report. . . . **W9LJV**, Waukesha, is heard regularly; has had some troubles with 144 mc airborne. . . . **W9YEG** is back on 2 with a good signal. . . . "Triple Y" is straightening out the beam situation. . . . **W9WTL** shows up on 2 only for the net, which is better than not at all. . . . **W9GZR** is kept busy with gas engines. . . . **W9ESJ** will get accustomed to traffic on two . . . **W9KQM** is QRL fixing "cyclops" (TV) and miscellaneous other items for others. . . . **W9TQ** had a visit from two prospective Novices wanting to clear BCI from the audio section of a "shiny, new cabinet." W9TQ's schedules with W9LJV, W9IMQ, W9PK, W9NVK, W9FAN, W9DDG and WN9OKF are successful, and certainly appreciated. DX and weather condition variables are of mutual interest to W9PK and W9TQ; schedule rechecks are made at midnight, when possible. . . . **W9FPE** visited the Milwaukee area; is now in Chicago area, relocating.

W9TQ caught the tail-end of the April 28 band-opening, working W9LUQ, W9LIR, W9ALE and W9GZH for nice QSOs. W9PK was heard better off the back of his beam than was W9SUV, so the estimate of the DX limit at 2330 was about 125 miles. Vic heard and called W9LF, Creve Couer, Illinois (near Peoria) several times, but no answer. The teletype schedule between W9DDG and W9TQ is usually solid, when the fellows get together. W9SKF has his "Iron Horse" working, now, and we have to get him on 144 mc for RTTY as well as the A3 gang, says W9TQ.

The Emergency Net, on 144.665, is busy building pack sets based on battery operation to permit complete freedom of movement. Other power units will be built, later. The size of the package has been determined by using the cases of the surplus ARR-1.



This is the typical 2-meter station package as produced by Jackson (Michigan) Amateur Radio Association. L. to r., power supply, omnidirectional antenna, receiver, transmitter and modulator.

W7CMX Reports Puget Sound 2-Meter Activity

"Two meters in the Puget Sound area of Washington is still very active and is becoming one of the best pipelines for 'grapevine reports' on the west coast. Stations heard in the Olympia area are: VE7MT, Victoria, BC.; W7BQX, Port Angeles; W7LBP, W7EOR, Everett W7EVO, W7EOP, WN7PRW, Seattle; W7BML, Bainbridge Island; W7EGV, Kent; W7LRF, W7LUF, W7MZS, W7NIL, W7MGN, W7MFG, WN7QZB, Tacoma; W7IEE, Mercer Island; and in Olympia, W7IJZ, W7HMJ, W7HPJ, W7KNV, W7NEY, W7DDY, W7NGZ, W7CMX, W7KLG, W7IG, and WN7PQR. There must be 10 or 15 other stations that have been heard in Olympia, but there just is no record of the calls, at present; certainly, the boys at Longview and Portland are coming in, and they should be included.

"DX, as spoken of in Texas and California, is out—here—but good, reliable communications up to 80 miles is being conducted, daily. We have a wide variety of cities involved in our 'Golden Frequency' (145.8 mc) such as Vancouver, B.C., Mount Vernon, Everett, Seattle, Bainbridge Island, Port Orchard, Port Angeles, Mercer Island, Kent, Tacoma, and—last but not least—Olympia. South of Olympia, the boys at the Longview Radio Club and Portland, Oregon, are going great guns on 146,25 mc.

"At the present time, 16-element 'Plumber's Delight' beams, for vertical or horizontal polarization, and 522 transmitters seem to predominate, although a number of 829B finals at 100 watts are crowding in with effective signals around the area. Some 3 and twin-3 beams are making their way in, helping to put the signal out, better.

"As for individuals, **W7MKW** has sold his two-meter gear and he now just listens; boy, can we give him the works. . . . **W7DDY**, Olympia, gets a good signal out of his Millen. . . . The Longview Radio Club has a pair of 24Gs on with 150 watts input and do very well. . . . Tommy Hutchins uses a 16-element beam, vertical or horizontal, whichever you want, and does a nice job with the 522. . . . **WN7PRW**, near Seattle, uses the same rig and gets comparable results. . . . **W7CMX** also has a 16-element beam, vertical or horizontal, and a 522. Many stations use ground-planes or vertical dipoles; they get out and normally do fairly well because the other guys have beams."

"Bish" **W7HEA**, Toppenish, Washington, is now on two meters with an ARC-5 and a horizontal 5-over-5 element beam; by the time you read this, Bish hopes to have 600 watts running into a pair of 4-125As.

"We are trying to build interest in two meters among the Novices, as well as among some of the old timers," says Bish, "but it's a tough battle around here. No DX has ever been worked from this valley, and most of the guys are just plain not interested. Their pioneer spirits died with the old folks, I guess. Hi!" (Stick to your guns, Bish. No DX was ever worked on any ham band until pioneering hams got on the frequencies and worked for it! On what kind of platters do our present-day "hams" expect their results to be given to them? —**VHF Ed.**)

Michigan Minutes

George D. Kerr, not yet a ham—but soon to be one—was selected by the Jackson Amateur Radio Association, Jackson, Michigan, to report its 2-meter activity to these pages. Thanks to George for a good report, and thanks to the association for the selection of a good reporter.

"GDK" says that the Jackson gang is on, every Wednesday night at 8:30 p.m. for the civilian volunteer net on 145.6 mc. After that, they scatter all over the band for a gabfest. At the last roll-call, 15 stations checked in from the Jackson area: WN8HKJ, W8RHB, W8JSK, W8WW, W8FMG, W8BAN, W8PYY, W8FYN, W8ZNI, W8DZW, W8KKB, W8RGR, all from Jackson; W8FRN, Jonesville; W8SSZ, Hillsdale; W8EEA, Coldwater.

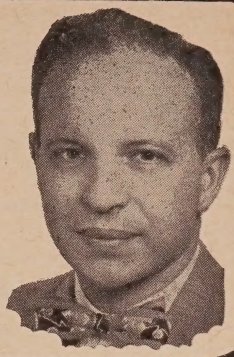
The club recently finished construction of 15 transmitters for two meters. This project was conducted on a production-line basis. (See "Michigan Minutes" in "The VHF News" **CQ**, March, 1952, page 49, column 2.) The transmitters function as follows: the third overtone of an 8 mc crystal is tripled to 72 mc, then doubled to 144. The tube line-up is: 6J6—6J6—2E26, built on a chassis 3" x 8" x 5". The accompanying picture shows a complete outfit, power supply, transmitter, modulator and antenna. The antenna is the answer to the switch-happy operator at the net control station. Before this antenna was derived, the net control beam was a whirligig; now, using the simplified array, signals from all directions are received without rotation. Stations within a 25-mile radius are heard "loud and clear." Coldwater and Lansing stations come in about S8. On Wednesday, April 23, it was reported that several of the gang heard Aurora, Illinois

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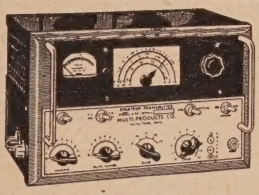


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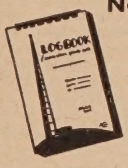


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(W9EQC), about 170 miles; he was called, but no contact was made. **(VHF Ed. Note.** On that night, W9EQC, yours truly, and others in the Chicago area enjoyed contacts with WN8HKH, Bangor, W8CVQ, Kalamazoo, W8BTL, South Haven, W8MRK, Muskegon Heights, W8EGX, Decatur, W8CZG, Battle Creek, and others.)

W8RHB has a 144 mc rig in his car, and demonstrated it while driving to the club meeting from his home in Concord, 15 miles southwest of Jackson. He was received very well all the way; the club had a portable station set up at its meeting place.

W8WRN's Ohio Report

WN8HPB, Phil Will (**VHF Ed. Note:** He should be nominated to columnist E. V. Durling's club, "My Name Is a Poem.") Canal Winchester, 15 miles southeast of Columbus, Ohio, is now on 2 meters. He uses a 5-over-5 beam, a Millen VHF transmitter, and a cascode converter employing a 6AK5, 6J6, 6AB4, 6AB4. The frequency is about 146.5 mc; he built the rig in a shielded cabinet with lots of filters and has had no reports of TVI.

"My old friend, George, W8BKI, Charlestown, West Virginia, has given up 2 meters," reports Ken. "He is no longer with the broadcast AM/FM station, there, so no longer has a good location for v.h.f. operation."

Jimmy, **W4OXC**, Louisville, Kentucky, is back on 2 and confirms that Floyd (ex-W4FBJ) is now W3SLI, Silver Springs, Maryland. Spring high winds also damaged the beam at W4MKJ, Louisville. . . . **W8CPA** and **W8WRN** definitely plan to attend the Turkey Run, Indiana, VHF meeting; Ken is working on a "surprise" guest from the south.

That old 6-meter man, W3BGT, Pittsburgh, Pennsylvania, is now on 2 meters with the "buffer"—he says—200 watts. Sam expects to have about 1 kw. going to VT-127As, soon.

The Republic of Texas Report

VHF Editor's Exclusive News: W9NFK, after 12 years in Chicago and Franklin Park, Illinois, moved to Houston, Texas, in early June as the proprietor of the new Texas Electronics Co. concerned with the installation, service and maintenance of v.h.f. communications equipment. Between getting settled, making a living and doing this column, Bill will be busier than the proverbial. . . . But, please still send your reports in to the address shown at the bottom of the first page of this column. Notice to all southerners and especially to Texans: Bill McNatt claims his full right to his "first papers" in the Republic of Texas by virtue of the fact that his parents were born and raised there; furthermore, his little boy, 'Gene, has been wearing a Confederate Army cap for more than six months, suh! And, on top of that, his wife, Helen, comes from the south of Racine (Wisconsin)! And, just furthermore, Bill was born in southern California.

Congratulations to John Naff, Port Neches, Texas, who is now W5TFW—the N was finally dropped as a result of John's perseverance with the code. May all two-meter Novices be so diligent! John says that the early arrival of hot weather produced a good east-west opening on the night of April 27. W5TDY, Thibedeaux, Louisiana, worked the Houston gang; W5ON, W5FEK and W5CVF put in very good signals. On the morning of the 28th, the path to the north was good. W5AJG, Dallas; W5AQS, Palmer; W5HHU, Dallas; and W5UHV were very strong. Also, W5CVW was finally worked; W5TFW had to use m.c.w., but he made it. A peculiar condition was observed—Dallas stations were very strong, but W5CVW in Fort Worth, only about 40 miles west of Dallas, was R5 but weak.

On May 6th another good coastal opening occurred and W5ONS, W5UB, Victoria; W5FEK, Houston; and W5TAF were very strong in Port Neches. That night, the band was open to the east. W5AIE, McComb, Mississippi, about 250 miles was the best DX heard. W5GIX, Baton Rouge, and W5HCM, New Orleans, were pounding in very nicely as was W5TDY. W5AOA, Sulphur, Louisiana, and WN5UJP were also heard. Texas activity was very good. W5AYU, W5FSC, W5FEK, W5CVF, K5FCN, W5ON, W5NHB, WN5VHR and W5HMM, all of Houston; W5OVP, LaPorte; WN5VDA/5, SeaBrook; W5QIO, W5QME and W5DSB of Beaumont; and W5TFW, Port Neches, all enjoyed the opening.

W5IRP, Lufkin, Texas, reports another excellent opening on May 10, extending from Victoria, Texas, to Jackson, Mississippi, about 475 miles. Bob worked W5NHB, W5UW, W5NZX, W5TFW, W5JTI, WN5VHR, W5TAF, and he closed the band with W5ONS. After completing medical school in Houston, Bob entered internship at the U.S. Naval Hospital, Great Lakes, Illinois, and will operate W5IRP/9 as soon as he can get set up.

W5FEK, Houston, reports that new two-meter stations in the gulf coast area are: W5TDY, Thibedeaux; WN5UJP and WN5URV, Lake Charles, Louisiana; W5QVQ, Victoria, Texas; W5AIE, McComb, Mississippi; WN5VHR and WN5UMC, Houston; WN5UVB, Beaumont; W5RAL, formerly of San Antonio, is now living in New Braunfels.

The South Texas Emergency Net convention at Kerrville, on May 10 and 11 was attended by several of the two-meter gang: W5QKF, Corpus Christi, W5RAL, New Braunfels, W5ON, W5GLS, W5BHO, and W5FEK, all of Houston.

Ontario and Western New York VHFers Meet

On May 16, the sixth get-together of the Ontario and Western New York VHFers was held at Oakville, Ontario, under the leadership of VE3BZP. About 115 or 120 persons enoyed Perry Ferrell's slide lecture on his work with **RASO.** Ken Bowles, W2ZGP, gave a slide lecture on aurora propagation. In attendance were 19 Ws, three SWLs from VE3-land, two XYLs, VE3DEA and VE3DER, the remainder of the group representing Toronto, Hamilton, Kitchener, Brantford, Peterboro, and Mountain View.

The seventh get-together of the group will hold on September 19th, on week after the close of the Canadian National Exhibition, under the guidance of the Niagara Falls, New York, v.h.f. amateurs with W2KEC in charge.

Turkey Run VHF Meeting

Don't forget to write to Charles Hoffman, W9ZHL, RFD 6, Terre Haute, Indiana, for information about the annual summer meeting of midwestern VHF men at Turkey Run State Park.

In And Around Chicago

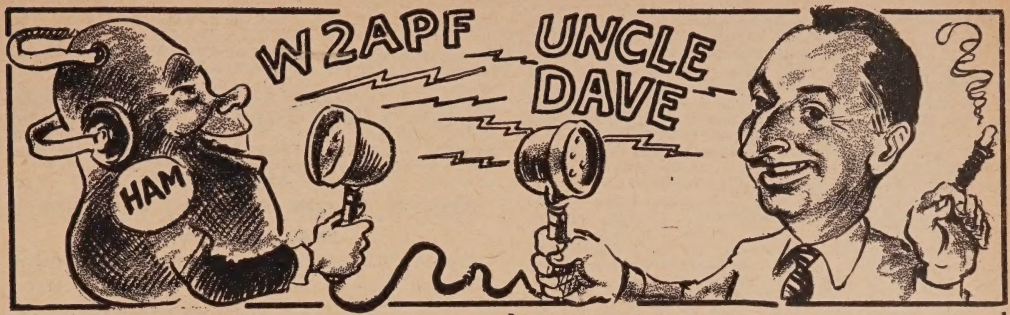
The write up on Clint Youle's weather reporting and the 2-meter gang in May CQ brought a nice plug for the magazine by Mr. Youle on one of his programs. W9NW and his ham weather reporters continue to do a good job for the public and v.h.f. amateur radio.

The northern Illinois, Wisconsin, Indiana, and Michigan gang enjoyed one of the year's best openings on April 28 when W8CVQ, Kalamazoo, W8MRK, Muskegon Heights, WN8HKH, Bangor, W8CZG, Battle Creek, W8EGX, Decatur, and of all the surprises, W8BTL, Al Labz, South Haven, Michigan! Al hasn't been on two for several years, and it was certainly pleasant to work him again. About five years ago, W8BTL, W8AKR and W8CVQ were consistent schedule pardners with W9BBU, W9IOD and others in the "across the Lake" tests after W9ZHB and W8CVQ (?) made it cross-band, 6 to 2, as I remember.

Leo, **WN9OKF**, is almost a "24-hour" station, operating from his bed at Home in Park Ridge. About 32 Chicago area v.h.f. men met recently at Leo's home for the Midwest VHF Club meeting. . . . WN9PBK, WN9SSI, WN9PUW, WN9PUO, WN9REM, WN9RXS are a few of the Novices now active; there are several others, but we can't quite keep track of them all. Bill Burke, W9VX, is responsible for many of the new calls in ham radio as a result of his many months of instructing CAP members in radio code, theory and construction. . . . **W9VNW** and **WN9OKF** have a friendly feud afire as to who can work the most stations per month; this should help the **"STAPERMO"** contest scores being recorded by W9NW. W9JGA, W9PEN, W9UMD, W9CT, W9CX had better watch out. Wha' hoppen to K9FAS, O'Hare Field?

Al Tumas, **W9CPF**, is still fighting the effects of the lead poisoning; the gang is with you, Al. . . . The 147.5 mc FM "Party Line" Net continues active, day and night. It's really comical to observe the reactions of some of the boys when the others start throwing m.c.w. around, even at less than Novice-class speed! The 147.5 gang helped out greatly in the Chicago CYO Regatta, according to W9VEZ who reports that CYO officials were very impressed with the job that the 147.5 and the 10-meter boys did. The Medical Civil Defense Net, 147.5 mc FM, and the 29.640 emergency net both had equipment in the mobile emergency trailer built for the Chicago civil defense show. W9LLX and W9KLB put in a lot of hard work on the deal.

W9NFK said "Goodby" in late May to as many of the Chicago area 2-meter gang as he could. Bill bought a VHF communications service company in Houston, Texas, and had to depart in a terrific rush. Reverting to first-person expression, I regret that lack of time prevented me from saying goodbye personally to every ham I've met during my 12 years in Chicago. Helen and I enjoyed every minute of time that we spent in Chicago we've met many wonderful people. Many fond memories go with us . . . the first Midwest VHF Club; the first band



TRANSMITTERS

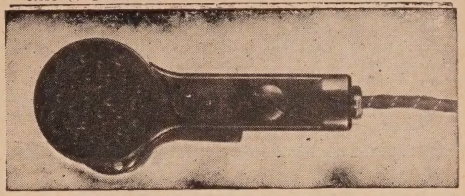
Johnson Viking Transmitter Kit less tubes, mike or crystal	$209.50
Full Kit of Tubes	39.00
Johnson VFO Kit, less tubes	42.75
Kit of Tubes	2.89
Harvey-Wells TBS-50C Bandmaster Senior	111.50
Harvey-Wells TBS-50 D Bandmaster De Luxe	137.50
Elmac Portable Transmitter Model A-54, uses carbon mike	139.00
Elmac Portable Transmitter Model A-54H, uses crystal or dynamic mike	149.00
Collins Model 32V3 Transmitter, less microphones and crystal	775.00
Lysco Model B-129 Transmaster 10 meter, less tubes	29.95
Lysco Model A-175 Transmaster 75 meter, less tubes	29.95
Lysco Model A-140 Transmaster CAP meter, less tubes	29.95
Lysco Model 381 VFO, less tubes	26.95
Lysco Model 401 Modulator, less tubes	19.95
Eldico 2 meter transmitter kit Complete	49.95
wired and tested	74.95
Eldico GDO kit Complete	29.50
wired and tested	43.00
Millen 90651 Grid dip oscillator	61.50
Morrow Converters, Model 2BR for 10-75 meters	54.95
Morrow Converters, Model 3 BR for 10-25-75 meters	64.95
Gonset Model 3005 Tri-band Converter	47.60
Gonset Model 3008 2 meter Converter	44.50
Gonset Model 3002 3-30 meter Converter	44.75
Gonset Steering Post Bracket	3.90
Gonset Noise Clipper	9.25
Eldico 2 meter Receiver Kit, Complete	59.95
Eldico 2 meter Receiver wired and tested	89.95

RECEIVERS

Collins 75 A2 with speaker	$440.00
Hammarlund HQ-129-X with speaker	214.00
RME-50 with speaker	213.50
National new model NC-183-D with speaker	385.50
National HFS with power supply	164.43
National HRO-50T1 with speaker	395.50
National SW-54	49.95
Hallicrafters new model SX-73	975.00
Hallicrafters SX-62, less speaker	289.50
Hallicrafters SX-71, less speaker	199.50
Hallicrafters S-72 portable, less batteries	109.95
Hallicrafters S-72L marine band portable, less batteries	119.95
Battery pack for Model S-72	4.17
Hallicrafters S-76, less speaker	169.50
Hallicrafters S-77A	99.95
Hallicrafters S-40B	99.95
Hallicrafters S-38C	49.50
Hallicrafters S-80	44.50
Hallicrafters S-81	49.50
Hallicrafters S-82	49.50
Hallicrafters Speakers for models SX-62, SX-71, S-76	19.95
Mallory VP-555-H Vibropack output 300-VDC @ 200 ma	33.63
Mallory VP-557 Vibropack output 400-VDC @ 150 ma	33.63

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4, 5 & 6 prong ceramic sockets made by Johnson each	$ .20
GE plate circuit relay, 8000 ohm, DPDT contacts close @ 8 ma ..... each	1.95



Single Button Carbon Hand MICROPHONES

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with push-to-talk switch, similar to T-17B ....MADE IN ENGLAND

Single button carbon hand	
72 ohm, one kilowatt win lead polyethelene insulation ..... per ft.	.09
per 100 ft.	5.00
300 ohm Twin lead ..... per ft.	.03
J-38 hand transmitting keys ..... each	1.29
Pyrex ant. insulators, heavy duty type 7 inch .... each	1.40
Coax. cable RG8U, 52 ohm ..... per ft.	.16
Coax. cable RG58U 52 ohm ..... per ft.	.07
Coax. cable RG59U, 72 ohm ..... per ft.	.09
Coax. cable RG11U, 72 ohm ..... per ft.	.19
Rebuilt television picture tubes, guaranteed one year. All types available from stock ..... (per inch plus your old tube)	1.20

VARIABLE CONDENSERS

	LENGTH	HEIGHT	WIDTH	EACH
MB70938 Capacity 3-26 mfd., .100 spacing	2	1¾	3¼	.75
MAPT6 Capacity 10-75 mfd., .100 spacing	3¾	2¼	2¾	1.20
MA60912 Capacity 10 mfd., .020 spacing	¾	1¼	1¼	.70
MA50986 Capacity 25 mmfd. per sec., .020 spacing, butterfly type	1¾	1⅝	1⅝	1.35
Acorn tube sockets made by EF Johnson for 954, 955, etc. tubes				.20
2 mfd. 1000 V pyranol cond.				2.95
2 mfd. 2000 V pyranol cond.				5.95
4 mfd. 3000 V pyranol cond.				9.95
Bias trans. 117 volt primary sec. 117 volt tapped at 104, 91, 78, 65, 52, 39, 26, 13 @ 40 ma.				1.95
Clarostat 50 watt rheostats, 250 ohm				1.35
			lots of 10	1.20
DeJur 50 watt rheostats, 50 ohm				1.25
			lots of 10	.99
DeJur 50 watt dual 2000 ohm				2.50
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Bud VFO-21 variable frequency oscillator	42.00
Gonset 2 meter Converter—LIKE NEW	39.00
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Hallicrafters SX-43 with speaker—LIKE NEW	160.00
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openings; the amazingly funny QSOs between W9DXZ ("If it doesn't work, something must be wrong!") and W9ELV, hearing W9IOD, W9BBU, W9WOK, W9PK, W9TKL, W9IPO, W9LWE, W9EQC, W9JIL and others work DX; the perennial QSOs between W9NW and W9GDM; W9WFC's success with the first W3GV beam in the Chicago area; W9FCN (the late Elmer Sweeney) and his expeditions to the Michigan sand dunes. Closing the band with W9ONO, W9KCW, W9NW, individually or collectively—a test of endurance; never did lick W9ONO, effectively, although one night W9VQS and I "matched" over the air to see who would call George on the phone at about 1:15 a.m. Yep, I got stuck; George almost got divorced; Floyd suddenly renewed interested in radio-controlled model airplanes! Then there were the visitng nights when the Aurora gang was host to the Chicago gang, vice versa. The older days, when **W9JPK** ("Just Plain Krazy, Beer-Barrel Hill, Milwaukee) was the station heard first and last when the lake-front openings occurred. And, so it could go on, for hours—memories of hilarious roundtables, spine-tingling band openings—the way W2BAV's signal tore up the whole Midwest a couple of years ago—enlightening technical discussions by the several engineers on the band, the way the band would come to life on an inactive night when certain W9s would "excitedly" call certain DX (there's no law against **calling** a station, that I know of) and, on and on!

Having already met many of the Houston, Texas, gang I look forward to close association with another fine gang of v.h.f. men. Next issue, the column will come to you from Houston.

THE FIFTH NORTHERN ONTARIO HAMFEST

This—in the fullest sense of the word, "sensational"—hamfest has been scheduled for three momentous days; Saturday, Sunday and Monday, the 28th, 29th, and 30th of June. Purportedly Canada's biggest and best, it is the fifth of an annual series of entertaining, intelligently planned festivals staged under the joint auspices of the Sudbury, Kirkland Lake and North Bay Radio Clubs. The nucleus of this year's activities will again be Camp Friendship, located two miles south of North Bay. The hamfest committee has provided, for your enjoyment, a party and dance for Saturday, a mobile treasure hunt, a program of games, and an evening banquet for Sunday, and on Monday, for a fitting denouement to the week-end revelry, a fifty mile boat cruise to French River. Write to Jack Barnaby, VE3TX, c/o Radio Station CFCH, North Bay, Ont., for accommodations and reservations.

Signal Corps Seeking Civilian Instructors

Civilian instructors in several communications skills are urgently needed near Augusta, Georgia, the Army Signal Corps said today. Jobs are at the Signal Corps Training Center, Camp Gordon, Georgia. Salaries range from $3,795 to $5,060 per year.

Instructors are needed in pole line construction, cable splicing, and manual teletypewriter-tape relay procedure. The Signal Corps is looking for former military teachers, or persons who have been trained in any of the following fields: telephone, central office maintenance, telephone installation and repair, pole line construction, communications equipment storage, communications center operations, power equipment maintenance, teletypewriter equipment maintenance, and cryptography.

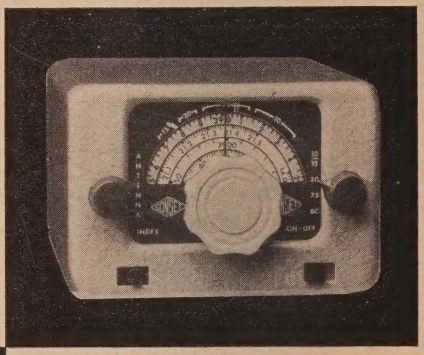
Interested persons should contact the United States Civil Service Commission, Board of Examiners, Camp Gordon, Georgia. Applications for Civil Service positions can be obtained at any post office.

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1625	29c	954	13c
VT-127	15c	E1148	49c
3C24	98c	2C26	9c
RK34	99c	2C26A	9c
304TH	$5.95	3D6	39c
1616	49c	15R	39c
1619	19c	39/44	29c
1626	19c	215A	9c
1629	22c	722A	99c
7193	19c	316A	29c
801A	19c	9006	19c
841	29c	9002	69c

TS-13 HANDSETS - BRAND NEW $9.95

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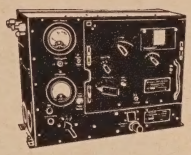
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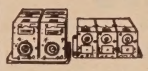
MODULATED TYPE WITH AC POWER SUPPLY .. 179.50

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T9/APQ-2 RADAR TRANSMITTER

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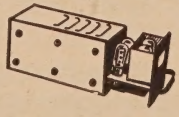




SCR-274N COMMAND and ARC-5 EQUIPMENT RECEIVERS

	USED	EXC. USED	NEW
BC-433 - 190-550 KC.		29.95	
BC-454 - 3 to 6 MC ..	8.95	9.95	
BC-455 - 6 to 9 MC..	9.95	11.95	16.95
TRANSMITTERS			
A-958 - 2.1 to 3 MC. ..			29.95
BC-458 - 5.3 to 7 MC.	7.95	9.95	17.95
ARC5-T-19 - 3 to 4 MC		24.95	34.95
BC-459 - 7 to 9.1 MC.	13.95	15.95	24.95
ADDITIONAL EQUIPMENT			
BC-456 Modulator ...	2.49	2.95	5.95
BC-450 Control Box (3 Receiver)	1.49	1.95	2.75
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RT-34/APS-13 Trans.-Rec. Less Tubes & Dyn. $2.49
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NOISE LIMITER

(from page 26)

at which limiting begins. While the actual limiting level may not be the exact calculated value under all operating conditions the difference will be extremely small and may be neglected.

One of the main disadvantages of the shunt type limiter is that since it never can be a perfect short circuit it never will be able to clip two incoming signals of unequal amplitude such as high amplitude noise pulses and lower amplitude modulation peaks, down to the same amplitude. If the distortion can be tolerated, better action on the weak signals can be had by setting the clipping level at 20 or 30% and if the distortion is too annoying on the strong signals (where it will be more noticeable) the limiter can be switched off. The author has used a limiter set for clipping at 20% and it was a great help to pull weak signals out of the ignition noise.

Tubes or Crystals?

Probably the most frequently employed diode in noise limiter circuits is the 6H6. It will perform quite well as a limiter as will other vacuum tube diodes of similar characteristics. If both sections of the 6H6 are available for use in a shunt limiter, it is recommended that each plate and each cathode be connected together. This will lower the internal resistance of the limiter and thus produce better clipping action. A germanium crystal diode such as the IN34 can be used in a shunt limiter quite satisfactorily. There is little choice between the 1N34 and the 6H6 as to the effectiveness of limiting in the high impedance circuits encountered in the usual second detector/first audio circuits. There will be some loss in available audio voltage due to the shunting action of a crystal since it will conduct slightly in the reverse direction. The germanium diode has the advantage, however, of smaller size and can be wired into the receiver under the chassis without the necessity for an additional tube socket and the heater wiring a tube limiter will require.

If variable selection of the modulation percentage at which limiting begins is desired, a potentiometer can be used at *R2* instead of a fixed resistor. *R3* is connected to the moving contact of *R2, (see Fig. 5(b))*. If *R2* is made equal to *R1* the clipping can be set to begin at any value between) and 100% modulation. The use of a variable limiter level control is especially useful for c.w. reception. The usual second detector BFO circuit is such that the detector will rectify the BFO r.f. and produce a large bias voltage at *C1* regardless of the strength of the incoming signal. Thus, the effective percentage of modulation of the BFO carrier by a weak incoming c.w. signal might be considerably below the level of a limiter fixed at 50% or so.

End of part one. Part two will appear in August.

THE ARKANSAS HAMFEST

The Conway Radio League is sponsoring an Arkansas Hamfest, and has scheduled it for Sunday, July thirteentn, at Lake Conway, eight miles south of Conway, Arkansas on U. S. Highway 65. Planned in an old-fashioned picnic style, this one promises to be lots of fun and everyone is invited to come and share in the festivities. Officials of the Civil Air Patrol have been invited to speak of communications work in the CAP. Don't miss it.

FOURTH ANNUAL DOWN EAST HAMFEST

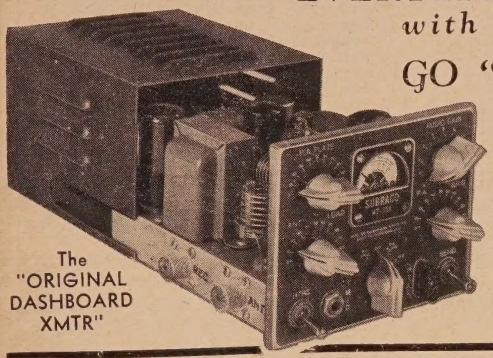
Additional information has been received regarding the Down Easter's Hamfest originally announced in our May issue. The Portland Amateur Wireless Association informs us that registration will take place on July 26th at 11 a.m. at the Eastland Hotel, in Portland. The banquet will be held at 6:30 p.m. Advance reservations should be made with Lee D. Johnson, W1QIQ, 92 William St., Portland, Maine. The registration fee is $4.50.

EGYPTIAN CLUB "PICNIC AND HAMBOREE"

The Egyptian Radio Club, Inc., of 700 South Chouteau Slough Road, Granite City, Ill., has scheduled its annual "Picnic and Hamboree" for July fourth of this year. It will be held at the club house grounds, located one block south of the New Chain of Rocks Canal Bridge on highway 66 between Mitchell, Illinois and the Mississippi river.

There will be no admission charge this year. Food and drinks will be available on the grounds, and the entertainment committee has planned contests and prizes of all descriptions, in order to make your day interesting and amusing. This festival is a prerequisite of a memorable Fourth of July week-end.

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PROGAGATION

(from page 32)

USA and Australasia. Referring to figure 1, we see that the lowest usable frequency (LUF), which is a function of solar absorption and atmospheric noise, does not exceed 20 mc. for West Coast circuits. If this is so, some good 15 meter openings can be expected. However, at the present stage of the are of propagation analysis, it is rather difficult to interpret absorption and noise factors on these exceptionally long circuits. I would appreciate reports of QSO's made on these circuits, indicating time of QSO, power and antenna used and RST rating. These reports may enable an evaluation of the accuracy of the factors used for determining absorption values on these long circuits. . . .

High absorption will definitely keep 20 meter signal levels down, but the band is expected to open to all areas of the USA during the hours the path is in zones of twilight or darkness. . . .

Fewer 40 meter openings are expected in July than occurred during the Spring months, and rather poor DX conditions are expected for 80 meters with few, if any openings possible.

ASIA

No ten meter openings expected until early Winter. . . . Some 15 meter openings possible from the USA West Coast to the Far East, nothing expected on 15 from the Central or Eastern sections of the USA.

On 20 meters, some openings are expected to most areas of Asia. from all sections of the USA. Signals will probably be extremely weak until a few hours after local sunset when signal intensities should increase. In this month's Propagation Tables, there is indicated next to Asiatic paths, that have a tendency to arrive over a long or short route, either an A or an E. A indicates that the path will most probably arrive from over Asia, E indicates that the path will most probably arrive from over Europe. . . . High noise levels and absorption will not permit many openings on 40 or 80 meters except possibly from the Pacific Coast to the Far East or from Eastern USA to the Near East.

DX and OVERSEAS

(from page 49)

BRAZILIAN 21MC PHONE/CW CONTEST:

WHEN: Phone section week-ends of July 5th and 19th. 0301 GMT Sat./6300 GMT. Mon. CW section week-ends of July 12th and 26th. Same times.

WHEN: Phone section week-ends of July 5th and invited to send their reports to LABRE, the following data: Time, GMT. Call Box 2353, Rio de Janeiro, Brazil. with sign of PY stations QSO'ing and series of figures sent by calling station. 2 points will be credited for each correct copy. The same PY station may be logged again providing there is a difference of two hours between last copy. Winners and second placers will be awarded special certificates in each country. (THESE RULES WILL BE MODIFIED SHORTLY TO ALLOW FOR ACTUAL QSO's WITH PY STATIONS.)

HZ1MY	Dick McKercher, Box 167, Jedda, Saudi Arabia.
KX6AH	1960 AACS, Navy 824 Box 11, PM, San Francisco.
W3ENK/KG6 (KZ5CB/W2AOS)	Cmndr.Chas.E.Biele, Naval Communication Station, Navy 926, FPO, San Francisco, or, via W3 bureau.

BOUND

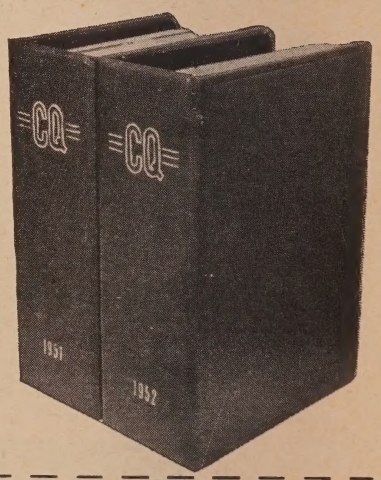
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A HETERODYNE EXCITER

(from page 19)

three planes. The panel is marked with decals which are easy to apply, fine looking, and low in cost.

This exciter has been in use for some time in a fringe area and there have been no TVI reports whatever. The unit is in a standard metal cabinet with none of the usual TVI precautions such as low pass filters in the feed line, screening of the lid, etc. All in all the exciter works like a charm and a few hours on the air with it will spoil you for any other exciter.

SCRATCHI

(from page 4)

diggeditys, now I going to get even with that movie manager, I shorting out speaker, calling HELLO TEST a cupple of times, and sure enough, can faintly heer voice coming from other neerby cars. Wowie! Whatever I say in mike coming out and being heard by all cars watching the movie. What an opportunity!

By turning on speaker, can heer the movie, then by turning it off can make comments to everybuddy. First chance are coming when hero and heroine are clutched in mad embrace. I making sound of reel joocy kiss. From here on, things are reely picking up. The hero are saying "darling, I am mad, mad, mad about you," and then I saying into mike "if you asking me you just plain crazy." And then . . . but, Hon. Ed., there are no cents in boring you with the detales. I are having more fun than anything. Everybuddy watching the movie are laughing themselves sick, and finally the manager of the drive-in are deciding enough is enough, so he putting notice on screen that everyone would be getting money back and there would be no more show that night. Fine spoil-sport he turned out to be!

At this moment I deciding I'd better be unhooking my lead-in wire and getting out of there but quicklike. Stooping under fence, are just about to get wire when I see the manager coming toward me on dead run. Oh-oh, I are saying to myself, forgetting two-bits piece of wire and get going. Hon. Ed., I are having 100 foots head start, and I are a fast runner, so should have had no trouble making getaway. All except for one thing. Just one small thing. You see, when getting into car, and stepping on starter—nothing. Hon. Battery are dead.

From this point on it are long, sad tale. Movie manager can't decide whether to sueing me for money he refunding, or just asking for death penalty. Matter of fackly, I happy to be in jale, after seeing how mad movie manager are.

At the moment it looking like I may be getting out soon, on acct. the jale grapevine are telling me that judge are deciding to release me after taking away my amchoor license. That'll be the day. I'l settle for that. Telling me, Hon. Ed., what you thinking Hon. Judge will doing to me when he finding out I not having any amchoor license? Be seeing you in 30, 60 or 90 days.

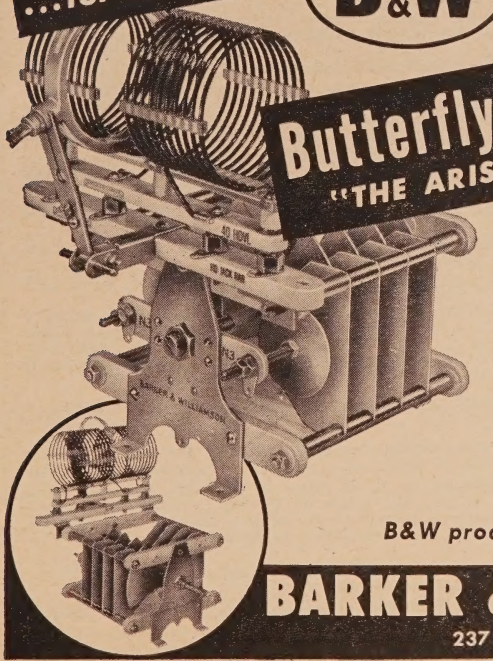
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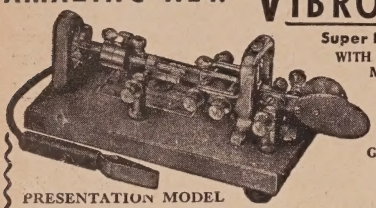
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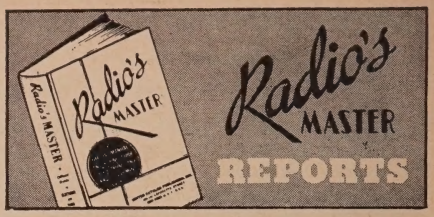
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To those of you who are ready to buy (or even to sell), these Reports will give you the latest price changes as well as the new and discontinued products. This monthly summary of the market is supplied by RADIO'S MASTER, The Industry's OFFICIAL Buying Guide, published by United Catalog Publishers, Inc., New York City. A complete description of each product is found in RADIO'S MASTER 16th Edition.

ANTENNAS & ACCESSORIES

Wincharger Corp.—Guyed towers #9454 and #9455 are once again being sold by Wincharger at $31.50 and $18.60 net respectively.

MISCELLANEOUS RADIO, TV AND ELECTRONIC PARTS

EBY Sales—Added K-302 kit at $3.69 net and 49-13 DD electrostatic TV socket at $ .48 net.

James Vibrapowr—Added new vibrator J-74 which is, as stated, equivalent to Raytheon #B-21A-12291, mobile communications.

Mallory & Co.—Increased prices on their VA series power supplies.

Sangamo Electric—Withdrew type 13 television paper tubular capacitors . . . type FM 15 electrolytic capacitors.

Technical Appliance Corp.—Reduced prices on #873-3, change-over switch (2 or 3 circuit) to $1.80 net.

RECORDING EQUIPMENT, SPEAKERS, AMPLIFIERS, NEEDLES, TAPE, ETC. . . .

Electro-Voice—Added model 430 utility floor stand at $10.20 net and model 423-G desk stand. Electro-Voice advises that the restrictions on the use of zinc are off and that manufacturing is now underway on their full line of stands.

Markel Electric Products—Added model 74-P at $72.00 net and 75-P at $78.66 net, playmaster 3 speed record changer equipped with Pfan-tone standard and micro-groove high fidelity pick-ups.

Miller Mfg. Co.—Added 3 new replacement cartridges for Astatic . . . 1 for Electro-Voice . . . 1 for Magnovox . . . 3 for Shure Bros.

Presto Recording—Added Y-5 recorder (for low impedance mike) at $771.00 list . . . T-99-H, dynamic microphone at $32.50 list . . . A-15-S, floor stand at $10.00 list and L-2 transcription player at $290.00 list.

Wharfedale (British Industries)—Added 3000 cycle crossover at $13.50 net.

Wilcox-Gay—Increased price on #2A10, 2 speed tape recorder to $159.95 retail price.

TEST EQUIPMENT

Supreme Inc.—Decreased prices on DC Microammeters models 2100, 2400, 3100, 3400, 4100 in ranges 0-50, 0-100, 0-200 and 0-500. Decreased prices on model 3100 and 3400 DC Voltmeters ranges 0-1, 0-3, 0-5, 0-10, 0-25, 0-50 to $9.25.

TUBES—RECEIVING, TELEVISION, SPECIAL PURPOSE, ETC. . . .

National Union—Increased price of 263 radio receiving tubes . . . decreased price of 27 . . . added 11 new ones.

Raytheon—Increased prices on 231 radio receiving tubes . . . decreased prices on 22 . . . withdrew 37 others. Advised of 50 new special purpose tubes . . . discontinued 54 . . . decreased prices on 83 and increased prices on 17 others.

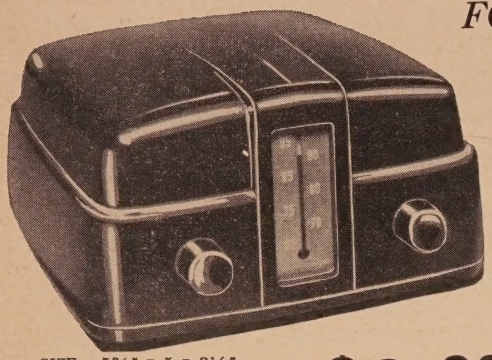
Sylvania—Reduced prices on 9 silicon crystal diodes . . . 7 germanium diodes.

Thomas Electronics—Decreased prices on 20 CR tubes.

Tung-Sol Electric—Increased prices on 167 radio receiving tubes . . . decreased prices on 10 . . . added 120 new ones.

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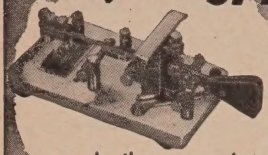


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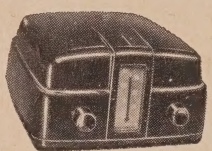
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ANTENNA RESONANCE

(from page 42)

With either method of tuning, *L2* should be mounted near the feedthrough point in the body, but a clearance equal to at least one coil diameter should be maintained between any part of the body and the inductor. If the variable tuning capacitor

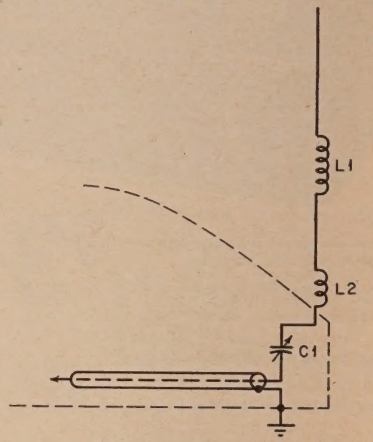


FIGURE 3A

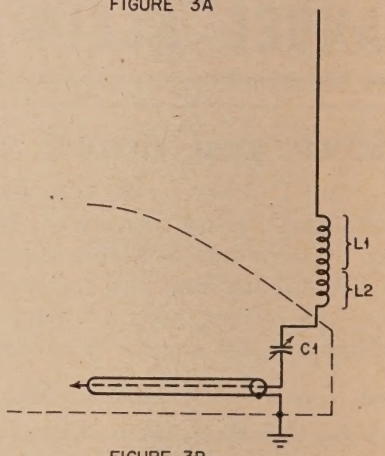


FIGURE 3B

Applications of the author's design.

is used, *L2* may be mounted outside at the base of the antenna (*Fig. 3A*) and tuning should initially be made at the lowest frequency with *L2* and *C1* short circuited. If the antenna is a base loaded affair, *L2* may be made part of the normal loading inductor (*Fig. 3B*) and in this case, the initial tuning of the loading inductor, at the lowest frequency, should be made with both *L2* and *C1* in the circuit. *C1* should be set at maximum capacitance. Base loading, of course, may also be used with the variable inductor, but the latter must still be mounted in the trunk for control purposes.

(Continued on page 69)

MEN of RADIO

PART III

(from page 36)

tors and became the most important factor in commercial wireless. There were rivals, many of whom made very valuable contributions to progress, but for many years control of a major portion of the industry rested with the Marconi Company.

Guglielmo Marconi, designer of the first practicable wireless equipment and founder of a vast industry, went on to discover a system of concentrating radio waves into a directional beam, invented many improvements in radio apparatus and made valuable investigations of high-frequency radio waves. His yacht Elettra was virtually a floating laboratory and it was aboard this craft that he conducted many of his investigations. Many honors were conferred upon him, including decorations in Great Britain, Russia, Spain and The United States. In 1909 he received a Nobel prize for physics, in 1915 an Italian senatorship and the title of Marquis in 1929. He died in 1937.

From a technical point of view, the development of radio sending and receiving equipment during the first few years of the Marconi Company's existence was not only very important but rather interesting. During most of the period, the spark or induction coil continued in use as the principal, if not the only, method of generating radio waves. The input power to the coil was constantly increased however; where Hertz had used a relatively low-powered coil supplied by a wet cell battery, Marconi commercial apparatus employed coils having an input power ranging from perhaps 250 watts to several kilowatts. Obviously, it would have been impractical to operate such coils from a battery, hence the transition to a motor generator set as the source of power was soon made.

An early Marconi transmitter and receiver are illustrated in *Fig. 1.* In this example, the coil is powered by a battery, *B* and the antenna and ground are directly connected to the spark gap, *SG.* At the receiver, the coherer, *CO* is connected between antenna and ground; note that no attempt is made to tune either the transmitter or the receiver. Direct current flow through the coherer energizes the relay, *RY;* closing of relay contacts provides a path for operation of the telegraph sounder *S* from the local battery *LB.* Of course, if a telephone receiver was used in place of the sounder, the relay was not needed. Due to the fact that the coherer filings tended to cling together even after the radio signal had ceased, some method of stopping current flow through the relay at the end of each wave train had to be provided. This was generally accomplished by means of a "decoherer", a device resembling an electric bell with the gong removed. Current flow through the coherer energized the bell magnet, causing the clap-

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HALLICRAFTERS SX71-S76
Write for liberal trade-in offer.
FILAMENT TRANS.
6V at 3 Amps.,
$1.45

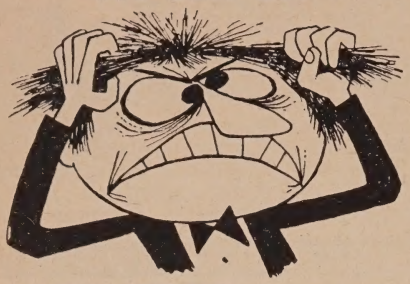
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Only .....**$1.95** complete
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THIS AD MAY BE SMALL — BUT IT CAN MEAN B-I-G MONEY TO YOU!

I want to buy BC-348, BC-342, BC-312, ARC-1, ART-13, BC-788, I-152, T-17 MKS. BC-221 or any parts thereof, no matter how small. In fact, I'll buy anything. I'm not kidding! Let me prove it!

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WE NEED	WE'LL PAY
ATC or T-47 type ART-13	up to $250.00
BC-348	up to 70.00
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R5/ARN-7	up to 45.00
TS-251	up to 175.00
FL-30 or F-21/ARA-9 Audio Filters ...ea.	up to 6.00

WANTED ALSO: TS-147, TS-148, RTA-1B, MG-149, plus parts or components. In fact we'll buy practically anything in this field. Phone, wire or write:

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Western Electric—type CR-1A/AR in holders. ½" pin spacing Ideal for net frequency operation. Available in quantities. 5910 - 6350 - 6370 - 6470 - 6510 - 6610 - 6670-6690-6940-7270-7350-7380-7390-7480-7580-9720. All fundamentals in KC. Good multipliers to higher frequencies . . $1.25 each
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MASTER OSCILLATOR

#6029	3-4 MC ..$1.85	#6030	4-5.3 MC .	$1.75
#6031	5.3-7 MC . 1.65	#6032	7-9 MC ...	2.35

POWER AMPLIFIER

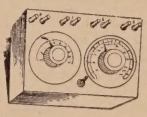
#7247	3-4 MC ...$2.19	#7250	7-9 MC ...	$2.98

ANTENNA LOADING

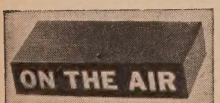
#6033	3-4 MC ..$1.39	#6034	4-5.3 MC .	$1.25
#6035	5.3-7 MC . 1.65	#6035	7-9.1 MC .	1.65

Send M.O. or Check. Shp. Chgs. C.O.D.
COMMUNICATIONS EQUIPMENT CO.
131 Liberty St., Dept. Q-7 New York 7, N. Y.

ACCURATE COMPONENT TESTER
Just Published!
Measuring Bridge Design Booklet



Gives complete details of a new circuit which permits rapid precision measurements of resistances, capacities and inductances. Complete plans—simple, easy text, tables, diagrams—which guide the technician, amateur or engineer in developing instrument with linearity of indicating scale according to own requirements!! Money Back if not satisfied. Send only $1.00 to
TECHNOLOGICAL DEVELOPMENTS
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Large, bright red letters are clearly read across the room. Fine for MOBILE or FIXED STATION. Black wrinkle case 5" x 2⅝" x 1". Uses screw base pilot lamp.
Price .....$1.50 P.P.

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per to strike the coherer tube and automatically decoherer the filings.

A most important improvement in Marconi apparatus was the introduction of tuning methods applied to both transmitter and receiver; this was primarily the work of Sir Oliver Lodge. The procedure at first involved the use of metal cones or cylinders to provide the necessary capacitance; later, adjustable coils were used together with an early form of variable condenser. *Figure 2* shows a variation of Marconi equipment in which tuning is accomplished by means of the transformer *OT*, which is provided with means of changing inductance through the use of spring clips. Originally, the condenser *C* consisted of two banks of large Leyden jars; later, a condenser having glass plate dielectric and sheet copper conductors was used. The use of mica as a condenser dielectric was not fully investigated until during World War I.

[*To be continued*]

YL'S FREQUENCY

(from page 28)

special interest is handling traffic. She is secretary of the C.Z.A.R.A. and a member of MARS. . . . **KZ5DG**, Grace Dunlap, hails originally from Massachusetts, but when Stateside now operates WØDLU. The XYL of KZ5GD, they have two jr. ops. Favorite frequency is 28.770, and she is a member of MARS. . . . **KZ5NN**, Dee Brewer, and her OM, KZ5TB, first met via ham radio when Tex was stationed on Okinawa. She comes from the middle west but calls Texas home; call there is W5TOW. . . . **KZ5BM**, Bess Morton, was born in the Canal Zone, but has the Stateside call W6GST. Bess works and has three jr. ops so QSOs are when she can catch them, usually on 28.900.

KZ5KA, Kay Howe, is an ex-Hoosier gal, the XYL of KZ5RM. Her other call is W9RIH, and her special interest is working maritime mobiles. **KZ5CN**, Bess Whittredge, comes from Texas and is the newest operator among the Q R Marys. The XYL of KZ5FJ, she also is W5VDH. Favorite spot is 28.930 and she also operates in MARS.

YL Get-Togethers

From **W8GJP** we hear that about 130 women attended the Dayton, Ohio, Amateur Radio Association's "Ham-Vention," of whom 11 were licensed YLs. These were: W8RVP, W8HUX, W8HWX, W3UUG, W9ILH; W9QLH, W9JUJ, W8JLP, W8FYT, W8HDB, and W8GJP. They had a luncheon at the Biltmore Hotel, played cards in the afternoon and visited a TV station where four of the gals took part in the program.

The Fresno Radio Club held its annual hamfest early in May with these YLs attending: W6BLI, FEA, GEV, GQZ, HHD, MWU, PJF, QVK, ZKD, ZYD and W4KZT.

The biggest YL get-together so far this year was the New England YL meeting held in April at Foxboro, Mass; 23 YLs turned out, many coming quite some distance. The YLs were: W1MCW, W1RYJ, W1VBT, WN1UPK, WN1UPZ, W1TUD, ex-W8BPT, W2EWO, W1UKR, W1FOF, W1SVN, W1HRB, W1MUW, W1UQA, W1SAJ, W1TRE, W1QON, W1FTJ, W1QJX, W1OME, W1BCU, W1HIH, W2WP. The gals enjoyed an FB luncheon and lots of rag-chewing. A couple of the YLs combine hobbies of flying and hamming. W2WP, Alice, flew up from Staten Island in her own Piper Cub. She landed near the place of the meeting and stayed overnight with W1BCU, Peg. WN1UPZ, Helen, also a flyer, is a member of the "99 Club" formed by Amelia Earhart.

W7HHH writes that the 20th annual Oregon Amateur Radio Assn. convention at Eugene drew a large number of XYLs and 16 licensed YLs. The gals took in a flower

show and made a tour of the University of Oregon. There also was a special breakfast with small fancy cups as favors. In the prize drawing at the banquet WN7RAX, June Trueax, won a VFO and W7HHH got an HY75. The YLs attending: W7ECC, FKS, FXE, GLK, GPO, HER, HHH, ITZ, JFM, NJS, NTT, and these WNs: WN7QWX, QXH, RAX, RGJ, RIC.

A note for future conventions and YL get-togethers. **W1QON**, Publicity Chairman for YLRL, would like to remind, the gals that the YLRL photograph album is available for conventions, etc. Eleanor would like a couple of weeks' notice so she could get it out in time, but would be happy to send it for any such meetings. And, incidentally, she would appreciate your additions to the album.

From **W6LBO** we hear that the Los Angeles YL Club has newly elected officers, with W6NLM, Beulah Barrick, president; W6KER, Gilda Shablo, secretary, and WN6PJU, Mildred Griffin, treasurer. W6NLM was awarded the Club's hotly contested Activity Contest prize for her consistent operations, net check-ins, and club attendance during the past year.

Another YL op-to-be is being welcomed with the arrival of a baby girl to **W6LMP**, Betty Shumaker. Congrats, Betty!

Till next month, 33—**W5RZJ**.

ANTENNA RESONANCE

(from page 66)

Where the variable capacitor is used, it is suggested that some sort of gear reduction drive arrangement, such as the *Millen* #10000 (16:1 ratio), be used between the flexible shaft and the capacitor. From the diagram, it will be noted that the capacitor must be insulated from ground, which will also require an insulated coupling between the drive mechanism and the capacitor rotor.

A number of different lengths of flexible control cable may be found in surplus. If available lengths are too short, several pieces may be connected together by an improvised coupling arrangement between them. Speedometer cable may also be utilized for the flexible control shaft.

During operating periods, the antenna should be remotely tuned to resonance as indicated by the point of maximum loading on the final amplifier. An alternate method of indication is the use of a simple r.f. field indicator, located on the dashboard, similar to one already described in CQ[3]. This device will indicate correct antenna tuning at the point of maximum radiation.

The choice between the methods of remote control tuning may be a question to be determined according to the availability of components, economics, and the convenience connected with each individual installation. No matter which of the two methods is used, the ability to maintain resonance and radiating efficiency, over an entire band, certainly outweighs the small losses, especially since measurements have indicated that these amount to a decrease of less than 0.5 db in field intensity.

NOTE: It is possible to build a variable inductance shown in the photographs from war-surplus parts currently available on the open market. One of the first models constructed by the author was made in that fashion.

3 "Crystal Ball for your Mobile Rig," George M. Brown, W2CVV; CQ, August, 1949, page 26.

ATTENTION
MOBILE HAMS

COMPLETE MOBILE PACKAGE — NOTHING ELSE TO BUY. OUTSTANDING MOBILE SIGNALS USE MOTOROLA EQUIPMENT—BACKED BY YEARS OF COMMUNICATION EQUIPMENT EXPERIENCE — WORLD'S LARGEST PRODUCER OF 2-WAY MOBILE EQUIPMENT.

A mobile transmitter with a double feature FM or AM at flip of the switch, the MOTOROLA FMT-30-DMS 27-30 MC. . . **$130.00**

P-7253 spring base rear—mount antenna. . **$23.13**

MOTOROLA P-69-13 or 18-ARS receiver with special noise limiter for use with any converter having 1440-3000 KC. **$60.00**

New Gon-set Tri-Band Spread Converter **$47.60**

3-30 famous Gon-set converter complete to connect to the P-69-13 or 18-ARS receiver **$44.75**

P-327-E Fire wall loud speaker **$7.50**

The above comes complete with all necessary accessories and mounting hardware. Order direct or through the Motorola National Service Organization member in your area.

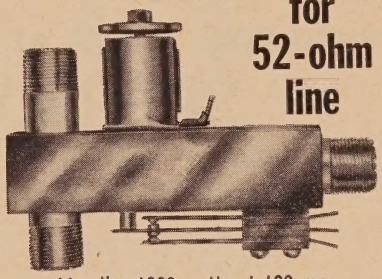
NOTE: This Receiver and Transmitter is equipment which has been returned from the field, modified and rebuilt for Amateur Service.

For further information write to:

MOTOROLA INC.

Amateur Sales Dept. CQ July
1327 W. Washington Blvd., Chicago 7, Ill.
Attention: Harry Harrison, W9LLX
Telephone—TAylor 9-2200, Ext. 161

New Type Coaxial Relay for 52-ohm line



Handles 1000 watts at 100 mc.
External s.p.d.t. switch on all voltage types.
Both AC and DC models available.

For greater efficiency and maximum receiver protection use a 115 Volt A.C. model at the home QTH.
110-115 Volt A.C. .....**$12.50** amateur net
6, 12, 24 Volts A.C. and D.C. **$11.50** " "

(For more complete details, see May 1952 advertisement in CQ)

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LETTINE MODEL 240
TRANSMITTER WITH MOBILE CONNECTIONS AND A.C. POWER SUPPLY

This outstanding transmitter has been acclaimed a great performer throughout the world. It is excellent for fixed station, portable or mobile operation. Even if you have a transmitter of your own you can't afford to miss this wonderful buy, direct from our factory, ready to operate.

The 240 is a 40 watt Phone-CW rig for 160 to 10 meters, complete with: (8 x 14 x 8) cabinet, self contained A.C. power supply, MOBILE connections, meter, tubes, crystal and coils for 40 meters. Tubes: 6V6 osc., 807 final, 6SJ7 crystal mike amp., 6N7 phase inverter, 2 6L6's mod., 5U4G rect. Weight 30 lbs. TVI instructions included. 90-day guarantee. Price $79.95.

$25. deposit with order — balance C.O.D.

80, 20, 10 meter coils $2.91 per set. 160 meter coils $3.60. Also for CAP, Broadcast, MARS, Marine, State Guard.

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NEW BC-453 thru 458; BC-1206. Xmtr, recvr, CRT, VHF and special tubes. Send for list. Cheap. W5DHJ, 1709 W. 30, Austin 3, Texas.

ATTENTION HAMS: Your station call letters in giant 3 inch, bright red plexiglas, complete with mounting track for only $1.98 per set. Send your call to: Pioneer Enterprises, Box 474, Grandville, Michigan.

CANADIANS: Complete Amateur Radio station equipment for sale. One-50-75 W. Phone and CW. xmtr in Hammond cabinet 16" x 21" x 36" high, nearly all Hammond parts. Xtal mike, seven xtals. Spare tubes. Works on all bands. One Hammarlund Comet Pro. Receiver with loud speaker, all bands including ten. One 2C. Frequency meter with manual. One Bach-Simpson No. 77 wavemeter and modulation meter-new. One SW3 National receiver. Approximately $150.00 worth of spare parts, including heavy duty power supply. Offered for quick sale at $300.00. First certified cheque gets this bargain. Rowley Noyes, VE5BI Drawer N, LLoydminster, Sask.

10 AND 20 METER BEAMS $23.25 up. Aluminum Tubing etc. Willard Radcliff, Fostoria, Ohio.

WANTED: Millen 90810 VHF transmitter, other VHF gear 522 ARC 1-3-4-5. Describe Price First Letter. Cyril F. Hoffman, Uvalde, Texas.

100 KC STANDARD CRYSTAL RCA No. VC5M Guaranteed, Crystal, Special 3 Pin Socket, and Circuits—$4.25 Post Paid. Crystal Research Products, Dumont, N. J.

IMMEDIATE DELIVERY: Power Supplies for Bandmaster transmitters, $39.50, F.O.B. Alco Electronics, 102 Marston, Lawrence, Mass.

KILOWATT TRANSMITTER, 10 and 75 meter bands, in good condition, sale $450 cash or reasonable trade. Full description and details on request. W4UHZ, 8230 Division Ave. Birmingham, Alabama.

TRADE: BC645 partially converted all tubes plus extras, want 2 meter transceiver, GE 200 microamp meter fan type case, want EUD GImix. Have many other items. Write Tanenbaum, W2AQ, 1535 E. 8 St., Bklyn. 30, N. Y.

BARGAINS: New and reconditioned Collins, Hallicrafters, National, Hammarlund, Johnson, Elmac, Harvey-Wells, Gonset, Morrow, RME, Millen, Meissner, Lysco, others. Reconditioned S38 $29.00, S53 $49.00, S40A $60.00, S4OB $79.00, SX43 $119.00, SX42 $199.00 SX62 $199.00, SW54 $35.00, NC57 $69.00, NC173 $139.00, NC183 $199.00, HR050 $249.00, HR050T1 $299.00, HQ129X $139.00, SP400X $259.00, Meissmer EX $59.00, Harvey-Wells TBS50 $79.00, DB22A, HF-10-20, HR07, Lysco 600, Collins 75A1, 32V1, 32V2, others. Shipped on trial. Easy terms. List free, Henry Radio, Butler, Mo.

QSL CARDS? Unbeatable samples 25c. Sackers, W8DED, Holland, Michigan.

FOR SALE: Globe King transmitter with coils for 40, 20, 10 meters, $275. TBY7 complete $17. Variety of parts, tools. Details from W2BKV, 119-14 80th Road, Kew Gardens 15, New York.

10-20-40 ELEMENT, 2 METER aluminum brownie beams. Made to order. Write W3LMC, 4330 Glenmore Avenue, Baltimore 6, Maryland.

GLOBE KING 400A. 400 watt CW or phone transmitter, 80 thru 10 meters, $299. R. M. E. VHF converter $59. Both items like new, used less than fifty hours. W5RJR, 2351 North Akin, Texarkana, Texas.

BARGAINS: New and used, Collins Hallicrafters, Hammarlund, National, RME, Gonset, Lysco, Mallard, etc. Write Dossett, W9BHV, 855 Burlington, Frankfort, Write Dossett, W9BHV, 855 Burlington, Frankfort, Ind.

SELL: Teletype equipment, Panoramic adaptor, BC-221 freq. meter, 250TH, LM freq. meter with modulation. Want: PE-237, GN-38, BC-1306, APS-3 cables. Technical manuals. T. Clark Howard, W-1-AFN, 46 Mt. Vernon St., Boston, Mass.

WANTED: Top prices paid—Navy selsyns 1F, 1G, 1CT, 5F, 5G, 5CT and BC-348, BC-221, AN/ART-13, AN/ARC-1, AN/ARC-3, RTA-1B. Lectronic Research, 719 Arch Street, Philadelphia.

WANTED: Your attendance at the Mid-American and Dakota Division ARRL Convention, September 5, 6, and 7, 1952. Nicollet Hotel, Minneapolis, Minn.

CRYSTALS, Ham or Novice, immediate delivery from stock. Mounted in FT-243 holders, ½" pin spacing. Novice 3700-3750 kc. "Ham" 1975-2000 kc, 3500-4000 kc, 7000-7350 kc, 8000-8200 kc. Your choice of frequency, plus or minus 5 kc. $1.00 each postpaid. Potter Radio, 1314 McGee, Kansas City 6, Mo.

SELL: Two used BC-453A receivers 85 kc. IFs, Never converted—$11. each postpaid W1RAN, 207 Thames Street, New London, Conn.

NOVICE TRANSMITTER KITS including crystal, meter, tubes, chassis, power supply—all parts. 20 watts (6L6) $19.95. 75 watts (6AG7-807-807') (80-11 meters) $49.95. Send $10, balance COD, express inspection permitted. Dixon Electronics Co., 13444 W. McNichols, Detroit, Mich.

FOR SALE: Hallicrafters S40-A, complete with calibration osc., and audio noise filter. Excellent condition. F. O. B., $60.00. Transmitter power supply, 650 v. @ 150 ma, and 300v regulated. Best offer. F. O. B. John B. Camp, W6AAI, 142 South "G" Street, Oxnard, California.

GOING TO TRY for an amateur radio operator's license? Check yourself with a complete coverage multiple-choice type test similar to those used by the F. C. C. Surecheck tests with answer key. Novice Class $1.50. Conditional and General Class $1.75. Advanced Class $2.00. Order your time-tested surecheck test today. Amateur Radio Supply, 1013 Seventh Avenue, Worthington, Minnesota.

QSLs! Samples 10c. Tooker, Drawer T, Lakehurst, N. J.

MAGNET WIRE, 22 to 40 on original spools, 30c per pound. W6SCR, 17 Sheridan Road, Oakland, California.

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WANTED: APR-4, other "APR-", "APS-", "APT-"; ARC-1, ARC-3, ART-13, BC-348, BC-221, etc.; TS-12, 13, 35, 120, 146, 155, 173, 174, 175, 323, other "TS-", particularly microwave equipment, Spectrum Analyzers; G-R, Ferris, etc. units; 723/B, 3C22, all tubes; manuals, meters, parts, cable. Littell, Farhills Box 26, Dayton 9, Ohio.

TEFLON TAPE: we have a limited quantity of teflon tape of the .005-inch thickness and 12-inch width for sale in sheets up to five feet long. Available for experimental amateur work at 8c per running inch. Box 162, c/o CQ Magazine, 67 West 44th Street, New York.

FIRST $15.00 gets CQ 1945 and 1946 bound in green-gold lettering. Send $20.00, get unbound 1947 and 1948 issues also. Ed. Newman, 217 New York Avenue, Massapequa Park, N. Y.

NEED ROOM IN ATTIC—selling out surplus gear—send stamp for list—RCVR, audio filter, signal shifter, back issues CQ, QST. Ed. Newman, 217 New York Avenue, Massapequa Park, N. Y.

CRYSTALS: low drift, high activity, tailor made, 3500 to 8500 kc.—FT 243's. Desired frequency within 2 kc. $1 each, .01% crystals $2. each. Hundley Crystal Co., 2951 N. 36 St., Kansas City 4, Kans.

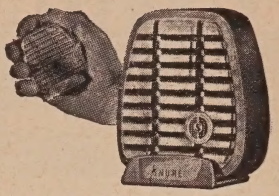
QSL CARDS $1.95 and up. Atlantic Press, Clifton, N.J.

TELETYPE MIDGET PRINTERS, tape transmitters; write for prices and information. We want: PE-237, BC-1306, GN-58, GN-45, TCS, ART-13, ATC, DY-11, DY-12, DY17, RA-34, RA-62, BC-348, BC-312, BC-342, teletype, APS, radar, BC-610-E, test equipment, technical manuals, tubes. Arrow Appliance, 25 Harrison Court, Lynn, Mass.

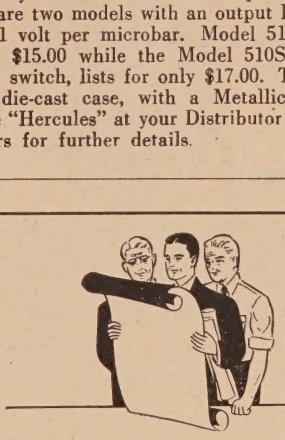
MAP PINS, round head, colors red, blue, green, yellow, orange, brown. One buck brings fifty. Robert Products, Harvard, Illinois.

QSLs—SWLs. Super-gloss. 10 colors, four card stocks, seven styles. Samples 10c. Almar Printing Co., Farragut, Iowa.

"The Hercules"



In amateur radio, just like lots of other hobbies, there are all kinds of gadgets and accessories which one acquires in time as a matter of course. However, probably the first item a radio amateur requires, after obtaining his basic receiver and transmitter, is a dependable microphone, so voice "contacts" can be made. Regardless of whether you are a new-comer or an old-timer in amateur radio, the new Controlled Reluctance mike, the "Hercules" (manufactured by Shure Brothers, Inc., 225 W. Huron St., Chicago, Ill.) warrants your consideration. It is a hand-held magnetic unit that provides clear reproduction, high speech intelligibility, high output and ruggedness at an amazingly low price. Being magnetic, this mike is practically immune to varying conditions of heat or humidity. The "Hercules" can be used indoors or outdoors, fits snugly in the hand, sits firmly on a desk or can be placed on a stand. There are two models with an output level of 52.5 db below 1 volt per microbar. Model 510C "Hercules" lists at $15.00 while the Model 510S, which has a built-in switch, lists for only $17.00. The "Hercules" has a die-cast case, with a Metallic Green finish. See the "Hercules" at your Distributor or write Shure Brothers for further details.



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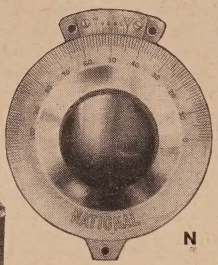
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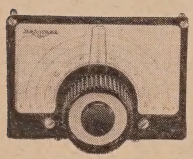
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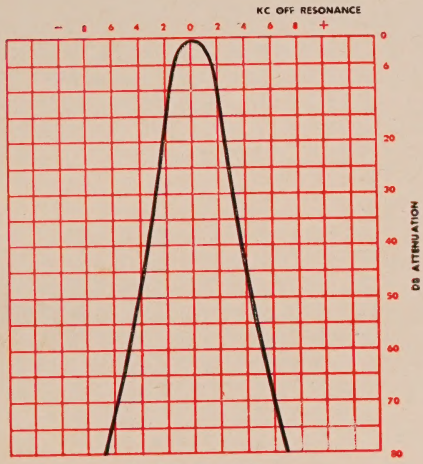
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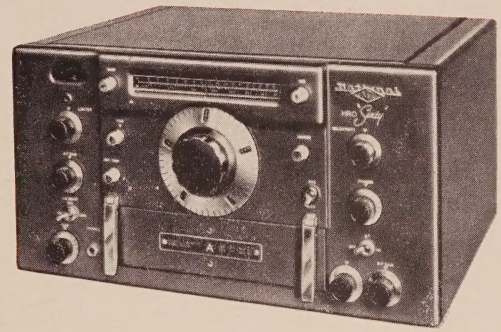
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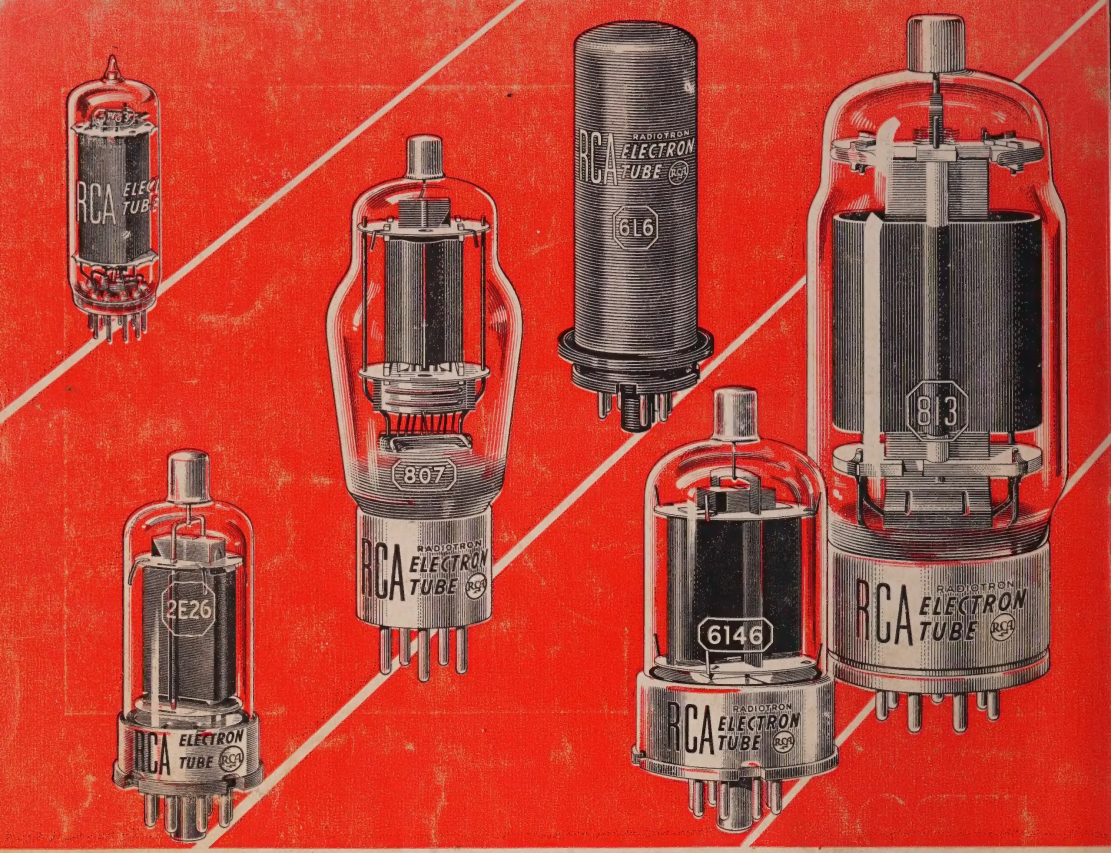
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