CQ

RADIO AMATEURS' JOURNAL

APRIL
1952

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1 HALLICRAFTERS Merit Awards will be given to every Novice who, during the period beginning 12:01 A. M., September 8, 1951, and ending 12:00 P M. September 7, 1952, (local time) works all states and has obtained by September 7, 1952, a General or Conditional Class Amateur License. Both Novice-Class and "regular" QSOs can be used to make up the total of 48 contacts.

2 Rules governing contacts and verifications thereof are the same as for ARRL W.A.S. Certificates (see page 6, "Operating an Amateur Station"). Your package of verifications must be postmarked not later than October 7, 1952.

Thanks to all of you who have already dropped us a line that you are "working all states" for the 1951-1952 Merit Awards. We would like to know the names of everyone who is competing —so we can publish later a list of calls, names and addresses of those in the running. This list will help you in your contacts.

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Bill Halligan, Jr. WN90EP
The HALLICRAFTERS Company, Chicago 24, Ill.

Dear Bill: I've started working on my ARRL W.A.S. Certificate. Have contacted_____states so far.

MY CALL_____ DATE OF LICENSE_____

NAME_____

STREET_____

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CQ

VOL. 8 NO. 4

APRIL, 1952

CONTENTS

OUR COVER

Just to scare you! No—He's not the youngest novice licensee.

Pictured working his rig is James Arthur "Butch" Townley, three year old son of W5FEK, Houston, Texas. "Butch," likes the VHF bands best of all. (The photo was Argus C-3, plus X at 1/30th at F8.)

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SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

How would you like to making a few thousand bux? Here is the chance of a lifetime—a sooperstewpendus Scratchi idea. It's a skeem that can't fail. It are so collosus it even amazing me. I just inventing a new type of transmitter. Now, before I can starting to make them in quantity, I needing money to buy parts, and that are where you are coming in. If you can lending me the money to buy the toobs and parts, I making these rigs, and when they selling like pancakes, I splitting the money with you thirty-thirty. (The other forty percent I keeping for overhead eggspences). What could be fairer than that? All you have to doing is sending my money, then sitting there in your office in your upholstered chair, flicking cigar ashes on the thick rug, while I keep busy mailing you your checks.

Because you are smart gentlefellow, and not wanting to invest in any wildkitty skeems, I will tell you about Scratchi's transmitter. When I get through I bet you are so anxious to sending me money that you will do it by telegraph money order. Here are the dopes. First of all, it are an all band rig. No plug-in coils, no bandchange switch—it works on any band. All you do is use 160 meter crystal, and transmitter sends out joocy r-f singal on all bands from 160 to 2 meters.

Of course, you having to use the right antenna. For ten meters must having ten meter antenna, and henceforths. If sumbody can designing all band antenna, it will work like falling off a log. But, even if having to use different antenna for each band, I still bet amchoors all over the country will be hocking there ant's spare set of false teeth to buying one of Scratchi's Mystic-Dystic White Box Transmitters. (I are thinking of calling it a black box, but everybuddy naming their pet project a black box, so I being difference. Besides, Hon. Brother Itchi are having cupple gallons white paint left over from last time he painting corral fence.)

At this point you are probably thinking that the minute Scratchi selling a cupple transmitters, some grate geenyus are going to look inside and discovering Scratchi's secrut, but this are where you wrong, as I are pulling reel slicky. All these transmitters that Scratchi making are going to be soddered together—no one is going to steel my secrut, on how to making all-band xmitter without changing bands, not by a jugfull. Now, Hon. Ed., if your thinking cap on strate, you can seeing how reely grate this idea is. How are amchoors going to change toobs?? They having to send there xmitter back to good old

(Continued on page 63)

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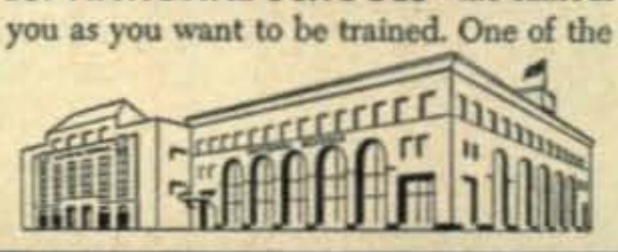

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Think of it! With guided missiles, radar, and other electronic devices so important to defense! And with over 90,000,000 radios, over 12,000,000 TV sets. With more than 3100 radio stations . . . over 100 TV stations—and more building every day—*what* an opportunity for you! If you act quickly! Men are wanted in Radio-Television-Electronics—America's fastest-growing field—now! Good-paying jobs—the kind *you* should have—can be yours!

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Broad Band . . .

A Vote on Docket 10073

Editor, CQ:

Following the release of Docket 10073 (see CQ, December, 1951, page 52) an individual mail poll was taken among the ARRL members in the ARRL West Gulf Division. Here is the summary of the "Fone on Forty" poll.

Approximately 2250 ballots were sent to all addresses of record. A total of 1207 ballots were returned, to date, or over 53%. The questions asked and the tabulated returns follow:

1. Shall ARRL recommend (to FCC) "Fone on Forty"?
   Yes - 853 (71%) No - 350 (29%) No opinion - 4
2. For what class or classes of Amateur Licensees?
   Extra - 356 Advanced - 517 General - 293
   Novice - 12 All - 86
3. On what portion of the 40-meter band? Segments were listed, and of the 846 votes in favor:
   7200-7300 - 625 (74%) 7250-7300 - 184 (22%)
   Other - 37 (total votes - either "not in favor" or "no opinion" - 361)
4. Shall ARRL recommend FSK on all amateur frequencies below 27 mc? (the Weitbrecht proposal)
   Note - ARRL has recommended FSK on 7250-7300.
   Yes - 207 (17%) No - 864 (72%) No opinion - 136

The tellers were W5WRS, W5LZD, W5FPB, W5FVO, W5MYR and W5CA. The above is the recorded vote of the ARRL members in the West Gulf Division on the above subject.

The tabulated data, as of December 24, 1951 was sent directly to the FCC in time to meet their deadline of January 2, 1952. On January 3rd a summary of the poll was sent to the Editor, QST, with a request for its publication. Also, the summary was sent to the Chairman of the ARRL Planning Committee and the President of the ARRL.

A. David Middelton, W5CA

Tijeras, New Mexico

(Editors Comment: The above letter is published as a matter of general interest to all hams. It is reliably reported that as a result of an Executive Meeting of the ARRL on February 9th the request made by Director Middelton was refused. The reasons for this strange state of affairs in the "democratic" ARRL are not immediately obvious. Possibly it is indicative that a non-conformist with the headquarters viewpoint will have rough sledding in attempting to air his findings - regardless of the fact that they represent those of over 1200 amateurs.)

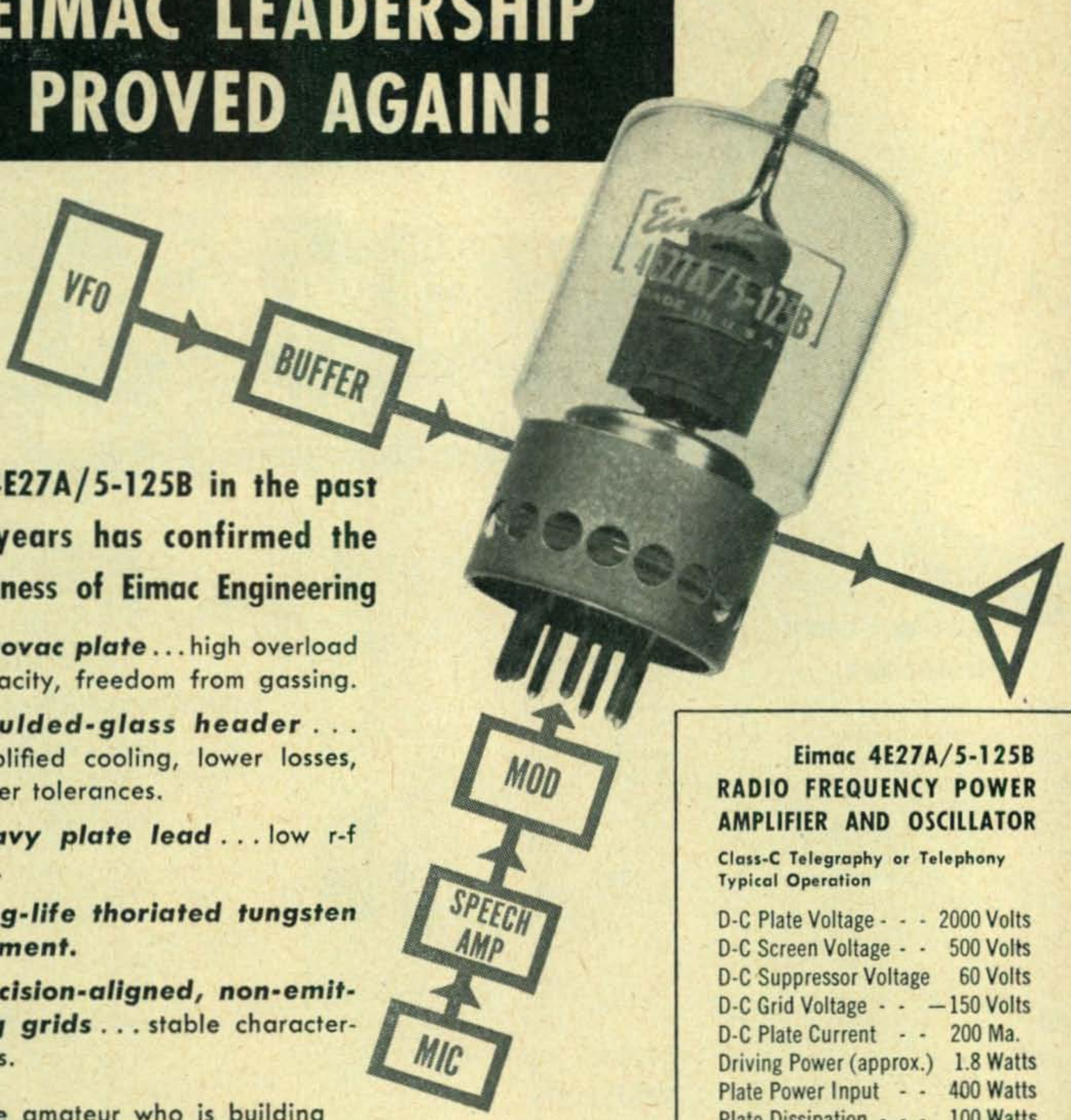
Present and Prophetic

OREGON AMATEUR RADIO CONVENTION

The Valley Radio Club of Eugene, Oregon will be host to the Oregon Amateur Radio Association Convention on the 26th and 27th of April. The sponsoring club reports that they have outlined a wonderful program with prizes and contests for all in attendance. The hidden transmitter hunt will be conducted on three bands—two, ten and seventy-five meters. K6BJ will demonstrate his kilowatt portable Eimac transmitter while W7HLB and W7LVN will show off their radio controlled

(Continued on page 20)

EIMAC LEADERSHIP PROVED AGAIN!



The 4E27A/5-125B in the past two years has confirmed the soundness of Eimac Engineering

- ***Pyrovac plate*** . . . high overload capacity, freedom from gassing.
- ***Moulded-glass header*** . . . simplified cooling, lower losses, closer tolerances.
- ***Heavy plate lead*** . . . low r-f loss.
- ***Long-life thoriated tungsten filament.***
- ***Precision-aligned, non-emitting grids*** . . . stable characteristics.

Eimac 4E27A/5-125B
RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR

Class-C Telegraphy or Telephony Typical Operation

D-C Plate Voltage	2000 Volts
D-C Screen Voltage	500 Volts
D-C Suppressor Voltage	60 Volts
D-C Grid Voltage	—150 Volts
D-C Plate Current	200 Ma.
Driving Power (approx.)	1.8 Watts
Plate Power Input	400 Watts
Plate Dissipation	100 Watts
Plate Power Output	300 Watts

For the amateur who is building with an eye to the future, a rig with a 4E27A is the answer for fone and CW at medium or high power. The high power output of this tube with its low driving power requirement and the simplicity of modulation make this tube one of the most versatile and least costly for both amateur and commercial applications. The 4E27A pentode is rated at 125 watts of plate dissipation, is capable of an easy half kilowatt input of class-C service, or when suppressor modulated will deliver 75 watts power output at carrier conditions.

- **Write for complete data on the Eimac 4E27A power pentode. Also, remember Eimac offers a personalized engineering service to help amateurs get the most out of Eimac tubes.**

Eimac TUBES

EITEL-McCULLOUGH, INC.
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Guest Editorial . . . .

Jointly by Major Charles C. Mack, Chief, MARS-Air Force
and Captain Lester A. Peterson, Chief, MARS-Army.

The Military Amateur Radio System (MARS) is what George Washington might have called a "respectably defensive posture."

You will recall that in his advice to his countrymen, Washington used these words: "seek legitimate political ends through peaceful negotiation and understanding, but, lest some aggressor should impose the other form of political action known as war or threat of war upon you, maintain yourselves in a respectably defensive posture."

Capt. L. A. Peterson, A4YCV/W4YCV

MARS, a joint operation of the Army and the Air Force, offers an opportunity to all U. S. licensed amateur radio operators to maintain themselves in a respectably defensive posture.

It does this by encouraging and coordinating activities of all radio amateurs who are interested in military radio communication.

The Armed Forces have selfish reasons for this program. Under our democratic form of government it is the policy to maintain a regular army, regular navy and regular air force as small as is possible, consistent with the missions entrusted to these forces. When it becomes necessary to expand these standing forces professional soldiers and existing military facilities are inadequate. Referring to this problem recently Major General Francis L. Ankenbrandt, Asst. Chief of Staff for Communications, Allied Air Forces Central Europe, said: "No technical advances have eliminated the need for the manual radio operator. To date, we have no automatic method that can in size, weight, frequency economy and simplicity compare with c.w. telegraphy; we have no system which will discriminate against accidental or intentional interference to the extent possible with a trained operator. There is no electronic substitute for an operator's brain. . . . Under marginal conditions the additional flexibility, simplicity, and reliability of a c.w. circuit frequency mean the difference between having communications and not having them." That is why we have our Organized Reserve programs, our Reserve Officers Training Corps and other types of training programs designed to provide manpower and know-how when required. That is also why we have MARS.

The demand for technical military specialists has now caught up with the supply. The ever enlarging scope of military communications demands more and more skilled radio operators and technicians. Every time an electronics skill is taken from private industry for use in military service it must be replaced. A capable technician or repairman in civilian life may find his services are needed to instruct others.

Of all the technical military skills, the time required to take a man with no knowledge of radio and to make a competent communicator of him is

Major C. C. Mack, AF4SLD/W4SLD

one of the longest. It is an expensive operation. Classes must be kept small, especially for accelerated courses.

Experience during two wars indicates that in a period of expansion the Army, the Navy and the Air Force have drawn heavily upon the resources and the capabilities of American amateur radio operators.

Any radio amateur, not already a member of MARS, who is over 21 years of age and would like to know more about military communications is invited to participate in the program and to

contribute something of his own skill and knowledge for the benefit of others. The Army and Air Force will provide the administrative guidance and coordination to insure an effective program.

What is required of MARS members? To answer that let us examine first the objectives of MARS and second the organization of this system.

MARS objectives are:

(1) To create interest and further training in military radio communications;

(2) To coordinate practices and procedures of amateur radio operations with those of military radio communications;

(3) To provide an additional source of trained radio communications personnel in the event of a local or national emergency.

This does not mean that you, as a private citizen, are going to be called into active military service if you join the MARS. MARS does not affect draft status.

MARS members who are also members of reserve units or are on active duty with the Armed Forces probably will find themselves phased out of the MARS program in the event of full mobilization. But the requirement for networks, for instructors, for technicians, for repairmen, for trained personnel will continue. MARS members can provide an effective tie-in at local levels between military commanders and responsible local authorities, notably Civil Defense officials. If a military commander has a requirement for a radio circuit to or near your locality and you have a station in operation he may be able to use you and/or your equipment until the need subsides or until an official circuit can be engineered and installed. Your services and your equipment will not help the military commander if he does not know they exist, or if they are not capable of being integrated into existing military radio systems.

This brings us to the second point—MARS organization. MARS organization follows those channels of command which are prescribed for the Army and the Air Force. If you decide you are interested in MARS you will be required to make a choice as to the service affiliation you prefer. This is a matter of personal preference. However, once the decision is made, your command training will follow channels prescribed to insure the successful accomplishment of the respective Service mission.

MARS drills are carried out on special military frequencies allocated for that purpose. In all drills military procedures are stressed. In order to integrate MARS with established networks of the Army, Navy, Air Force, Coast Guard or other military organizations the use of Joint Army-Navy-Air Force Publications procedures is required. Radio procedure is formulated to insure a rapid and accurate method of transmitting and receiving messages in a brief, definite and uniform language.

It can be assumed that enemy interception takes place every time a transmitter is placed in operation. Therefore, the first rule in maintaining radio transmission security is to train radio operators in the principles of circuit discipline. It is possible to derive intelligence of major importance simply from monitoring circuits for deviations from prescribed procedure.

Complete information as to how MARS operates in your area and what networks are established, together with times and frequencies employed, may be obtained from the MARS Command Director of the area in which you reside.

FOR DETAILS OF MARS OPERATION YOUR AREA OR TO OBTAIN APPLICATION FORMS WRITE TO:

ARMY

Commanding General
..... Army
Attn: Signal Officer

First Army area:
Governors Island, New York.
New York, Vermont, Rhode Island, New Hampshire, Maine, Massachusetts, Coonecticut, New Jersey.

Second Army area:
Fort George G. Meade, Maryland.
Pennsylvania, Ohio, Kentucky, West Virginia, Maryland, Virginia, Delaware, District of Columbia.

Third Army area:
Fort McPherson, Georgia.
Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, Florida.

Fourth Army area:
Fort Sam Houston, Texas.
Oklahoma, Texas, New Mexico, Arkansas, Louisiana.

Fifth Army area:
Chicago, Illiniois.
Wyoming, Colorado, Kansas, Nebraska, Missouri, Iowa, North Dakota, South Dakota, Minnesota, Wisconsin, Illinois, Indiana, Michigan.

Sixth Army area:
The Presideo of San Francisco, California.
Washington, Oregon, California, Nevada, Arizona, Idaho, Montana, Utah.

AIR FORCE

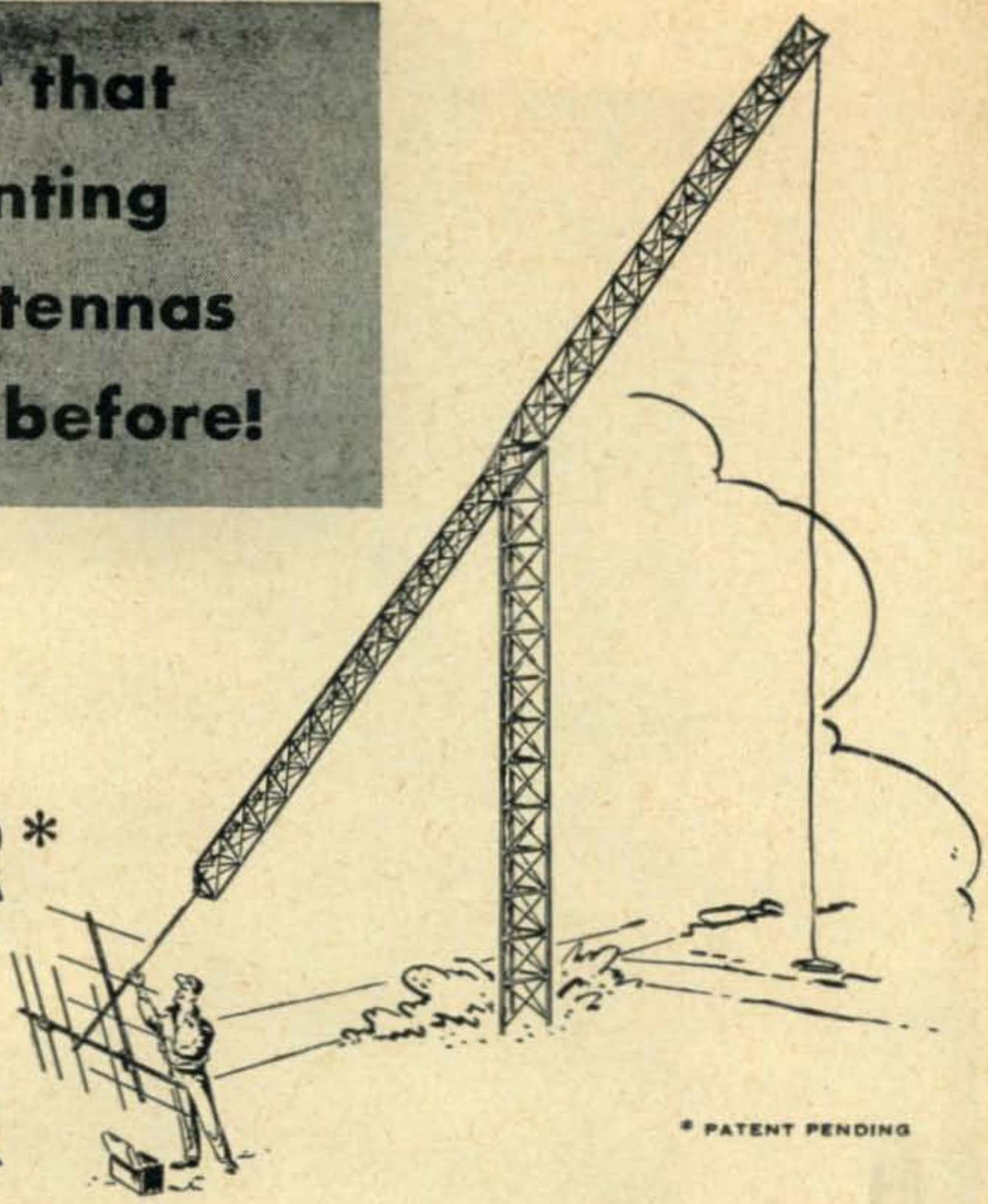
Commanding General
..... Air Force
Attn: MARS Command Director

First Air Force area:
Mitchel Air Force Base, New York.
New York, Vermont, Rhode Island, New Hampshire, Maine, Massachusetts, Connecticut, New Jersey, Ohio, Kentucky Virginia, Pennsylvania. Delaware, Maryland.

Fourth Air Force area:
Hamilton Air Force Base, California.
Washington, Oregon, Montana, Idaho, Utah, Nevada, Arizona, California.

(Continued on page 63)

here is the tower that makes experimenting and repairing antennas easier than ever before!



THE TEL-A-RAY

SWING-OVER* TOWER

* PATENT PENDING

Now antenna experimenting, servicing and repairing are easier than you ever imagined — with the Tel-a-Ray Swing-Over Tower — the only tower that actually swings over to the ground or roof.

For DX results, the antenna system must be in perfect condition . . . the rotor serviced, connections cleaned, and the beam element readjusted regularly. **Now you can do it while standing on the ground or roof!**

Built from durable steel angles and embodying all-welded construction, the Swing-Over Tower can be raised or lowered by you alone in just three minutes. Yet, it is guaranteed against all wind and weather damage. Finished in asphalt-base aluminum paint over perfectly clean steel, it cannot rust or corrode.

The model TT1, for ground installations, can be mounted into a small block of concrete and requires no guy wires. Reaching 50 feet high, it will easily mount a 20-meter array and rotator with ease. The TT2, 24 feet high, for roof tops, also employs the exclusive Swing-Over feature.

Simple to assemble . . . low in price . . . requires no machinery . . . easy to modify for special installations — the Swing-Over Tower is the answer to many of the radio amateur's troubles. See your radio-television jobber or write direct to Tel-a-Ray today!

SEE YOUR RADIO-TV JOBBER OR WRITE FOR INFORMATION TO

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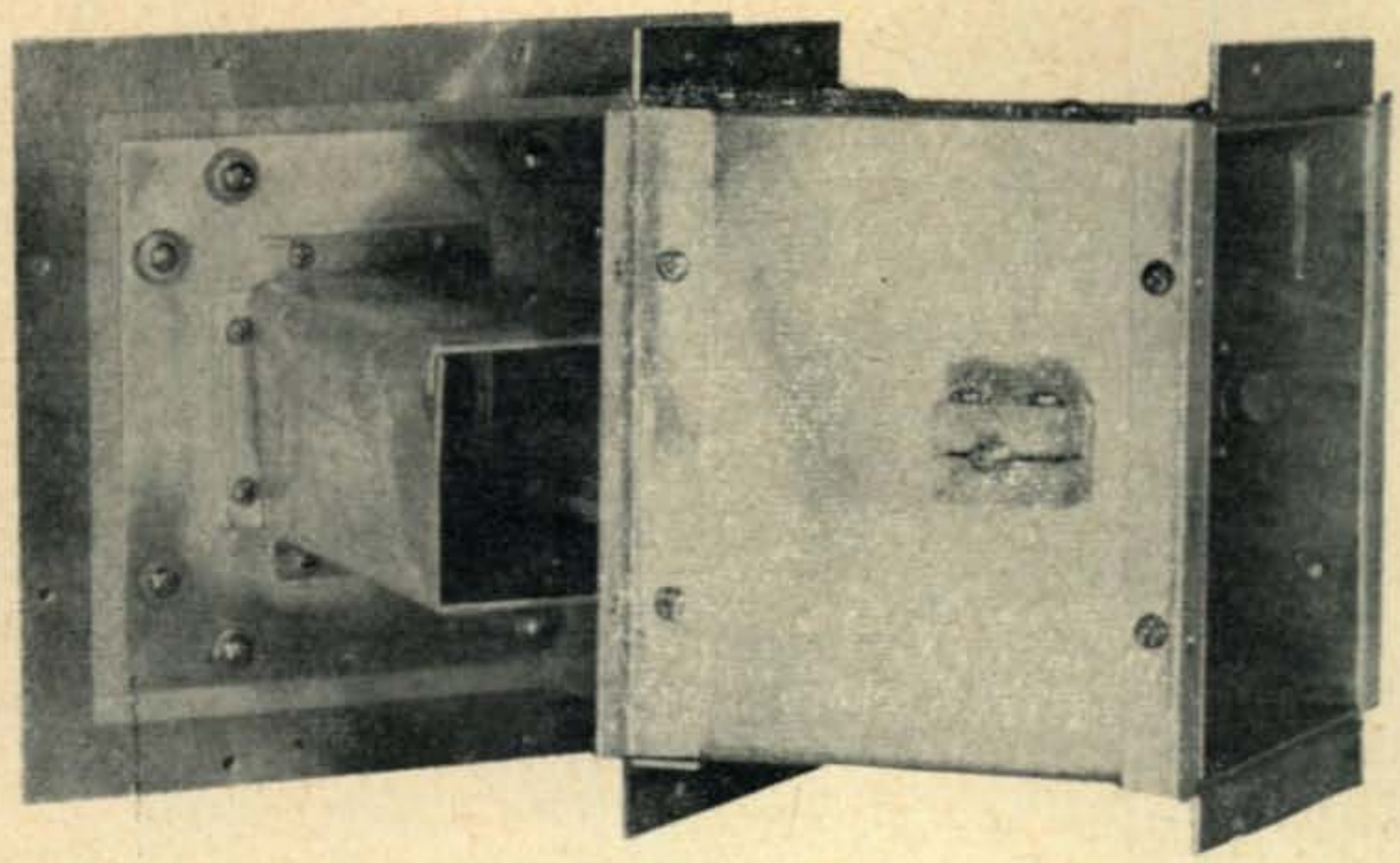
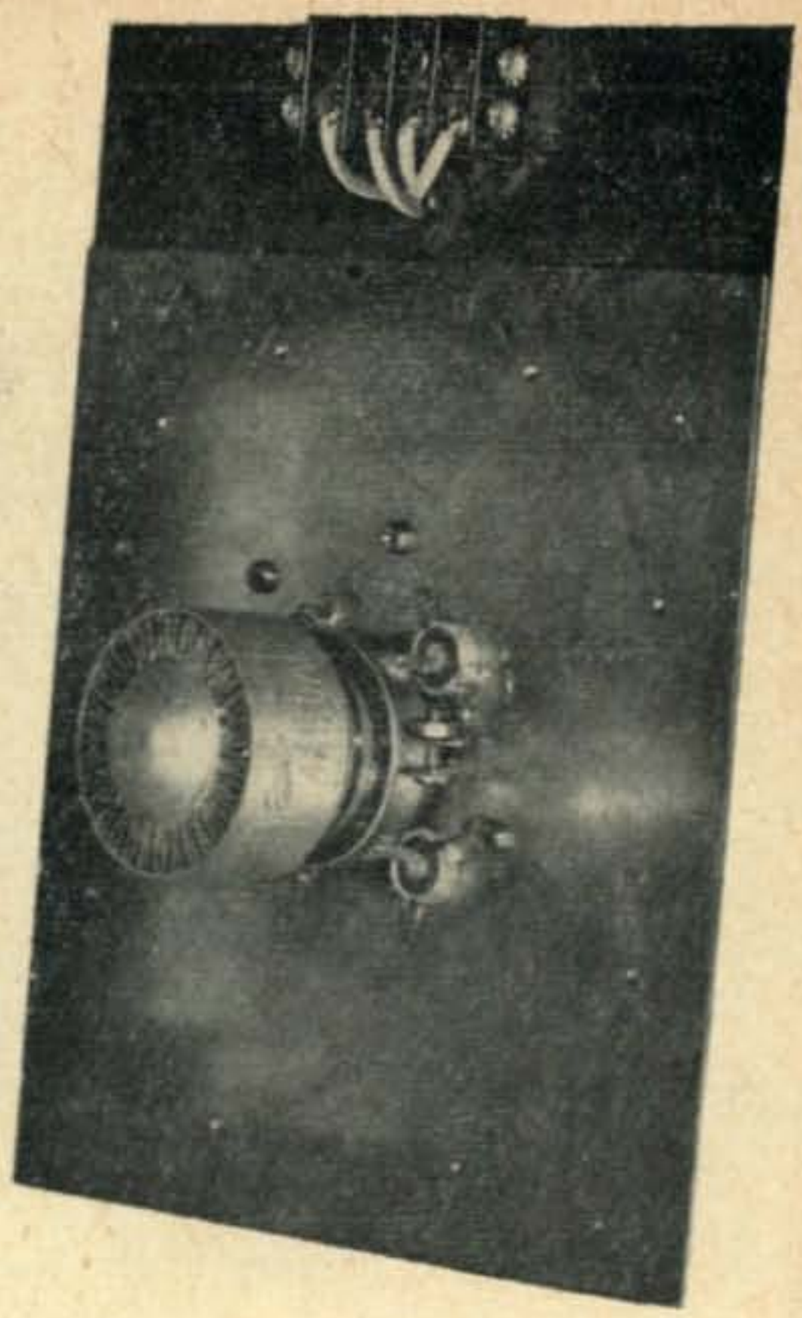
TRADE MARK





50 Watts

Crystal Controlled

on 420 Mc

ARNOLD M. BUCKSBAUM, WØWGZ*

This is a final amplifier designed for the serious VHF operators and technicians interested in the ¾ meter band. Its most novel feature is the use of a rectangular coaxial circuit element which can be easily reproduced by the average amateur without resorting to a machine shop. —Editor.

Power output has been difficult to obtain on the 420 mc band. The amateur has never had to worry about exceeding the limit of 50 watts peak antenna power imposed by the FCC. The proper tubes for obtaining that much power have not been readily available to the average amateur.

With the introduction of the new 4X150A power tetrode, low powered UHF transmitters can be constructed with almost as much ease as those for VHF work, although circuit techniques are radically different. An amplifier using a 4X150A tube and tripling in frequency to 420 mc will give a power output of 50 watts. This is under normal operating conditions of 750 to 1000 volts on the plate and a high grid drive from an 832A or 829B amplifier.

The 4X150A manufactured by Eimac, shown in *Fig. 1,* is designed especially for plate circuits of the coaxial type. Connection to the external anode structure which is 1⅝ inch in diameter is ideal for the center conductor of coaxial resonator circuitry. With the tube placed in a loctal socket, the screen grid contact ring is in an excellent position for efficient bypassing to ground. A grid connection is made to the center pin of the loctal socket. Four of the base pins are cathodes, two are for the filaments, and another for the d.c. screen grid voltage.

Using the 4X150A in a tripler power amplifier circuit is the easiest method of obtaining power on the 420 mc band. Power at one-third the output frequency is available at many VHF stations from transmitters now operating on the two-meter band. The output power of an 832A or an 829B is sufficient to drive the 4X150A tripler amplifier. The circuit diagram, *Fig. 2,* presents the simplest type of grid circuit. The parallel line *L1,* through the blocking capacitance *C1* to ground, is self-resonant with

---

*1608 1st Ave. N.E.,
Cedar Rapids, Iowa

the input capacity of the tube. Drive power is obtained by the mutual coupling between *L1* and the output plate circuit of the final tube of the two-meter transmitter. The grid resistance, *R1*, provides the necessary grid bias.

The plate circuit is a capacity tuned coaxial resonator. A coaxial transmission line less than one-quarter wavelength long and shorted on one end presents an inductive reactance at the other end. The plate resonant circuit for the 4X150A is made up of its output capacitance, 4.7 mmf, and a foreshortened length of shorted coaxial line.

The following formula may be used to find the length of the coaxial resonator:

$$X_C = Z_O \tan \frac{2\pi S}{\lambda}$$

X_C - Output capacitance reactance of 4X150A

Z_O - Characteristic impedance of coaxial resonator

λ - Wavelength at operating frequency

S - Length of coaxial resonator

A center conductor diameter equal to the external plate diameter of the tube was chosen. For a Z_o=50 ohms the outer conductor diameter should be slightly less than 4 inches as found from the formula Z_o=138 log b/a. The value S, obtained above, may be considered approximately correct for a particular operating frequency. However, in order to tune over the band 420 to 450 mc, a shorter line length than calculated for the high end of the band is actually used. A disk-type condenser can then be placed in the circuit for tuning purposes.

The outer conductor of the resonator is bolted to the "ground plane" to which the screen grid contact ring is bypassed by C_3. The screen grid pin which connects to the d.c. screen voltage is bypassed by C_4. The plate blocking condenser C_5, built into the coaxial resonator, keeps the outer conductor at ground potential while the inner conductor carries the plate voltage to the anode. The disk tuning capacitance, C_6, varies the resonant frequency of the resonator by changing the inner to outer conductor capacitance. A coupling capacitance, C_7, to the output coaxial transmission line will load the circuit sufficiently to couple power out of the resonator.

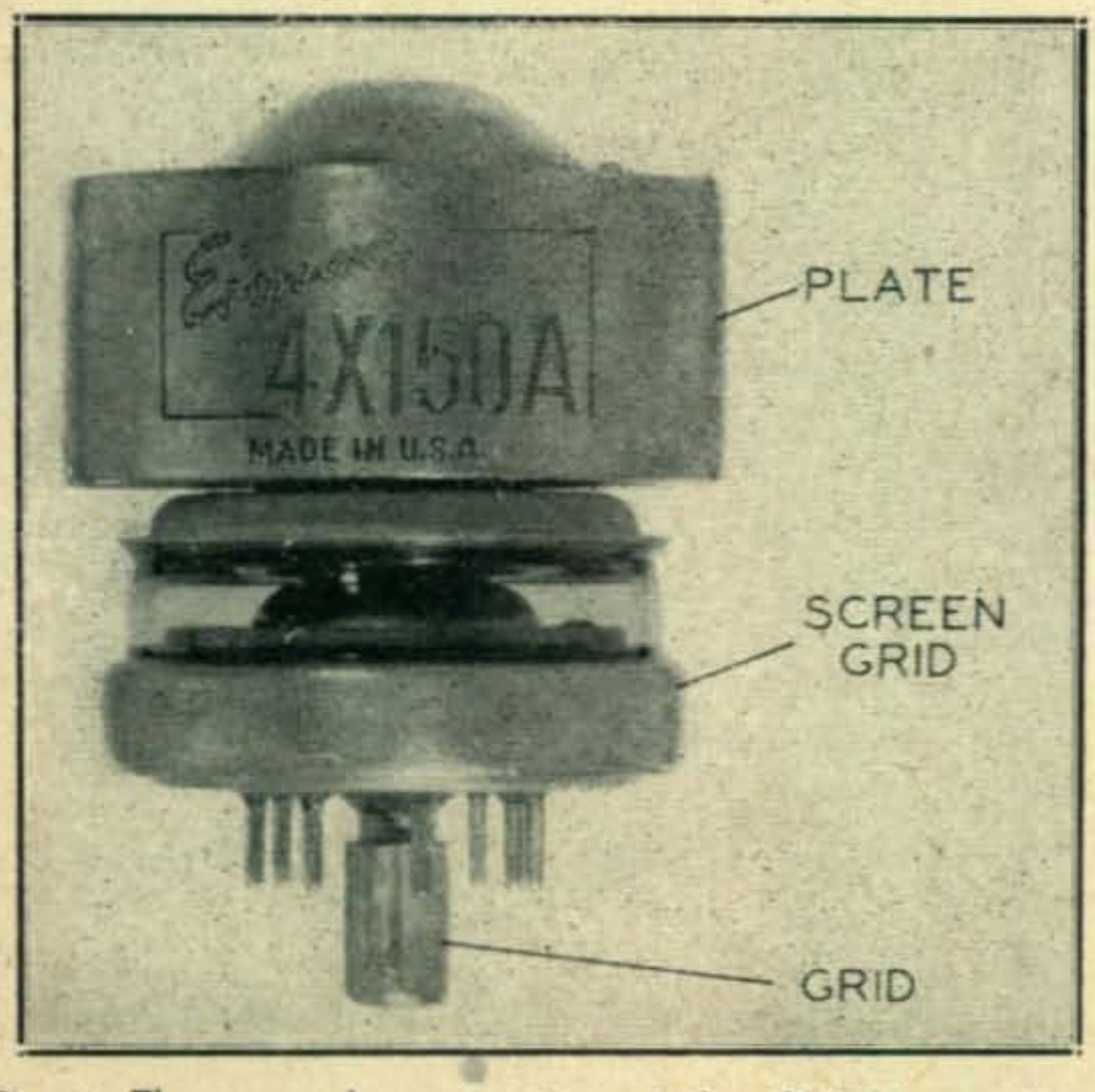


Fig. 1. The unusual construction of the 4X150A permits relatively high efficiencies at 420 mc. The tube must be used with an air blower.

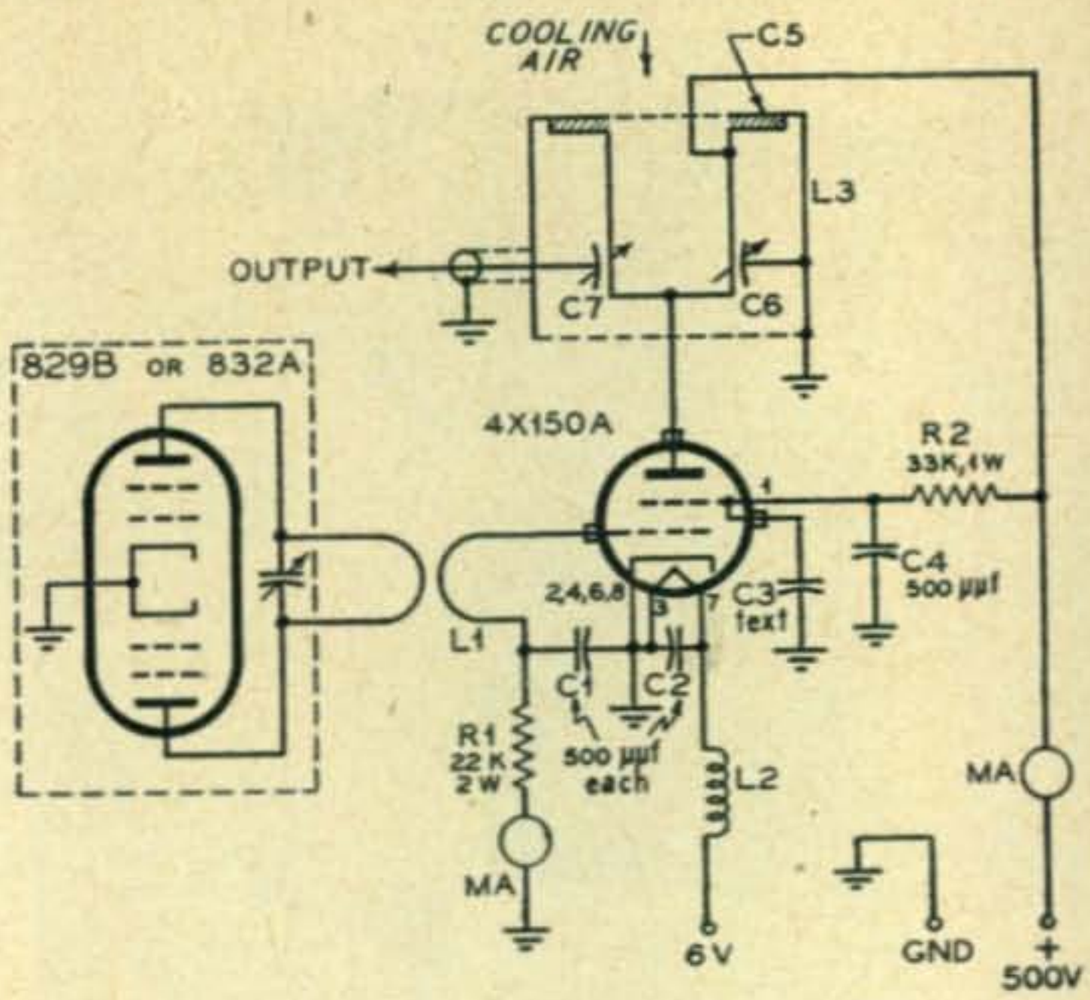


Fig. 2. Schematic of the 420 mc tripler.

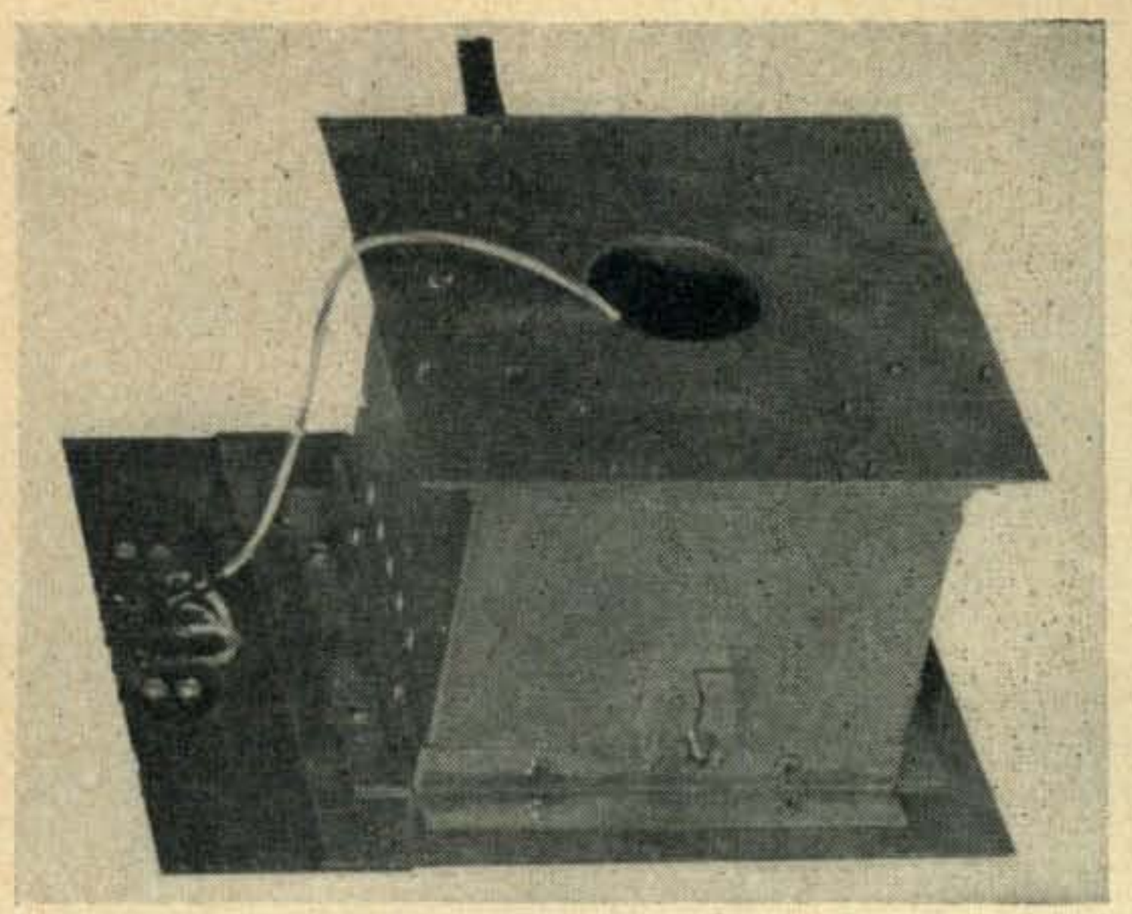
CIRCUIT DIAGRAM COMPONENTS

C_1, C_2, C_4	500 mmf silver-mica capacitance (Erie Resistor 370-FA)
C_3	Four 2400 mmf silver-mica capacitors (Sangamo Type M-38), see text on contact clamp.
C_5	Plate voltage blocking capacitance, see text.
C_6	Tuning disk, see text.
C_7	Output coupling capacitance, see text.
L_1	Grid parallel line, #12 enameled wire, 2" long, 1" wide.
L_2	17 turns, # 20 enameled wire, 1/4 inch diameter, 1/2 inch long.
L_3	Plate coaxial resonator, see text and photographs.
R_1	22,000 ohms, 2 w
R_2	33,000 ohms, 1 w

Construction

The method of construction is presented in the exploded view of the plate resonator, *Fig. 3*, and the photographs.

A loctal tube socket is mounted in the center of a 6" x 6" sheet of brass. The only socket available at the time of construction of this amplifier contained a molded bakelite type of insulation. It would be preferable to use a ceramic insulated type which has fewer losses at UHF. In the photograph of the bottom view of the socket, notice the brass ring surrounding the socket. This ring is soldered to the socket's mounting ring and provides a short path to ground for the four cathode pins and one



An assembled view of the 4X150A tripler amplifier.

filament pin which are soldered to it. *Pin 5* of the socket is not used, so it has been removed. Three pedestal silver mica condensers (*C1, C2* and *C4*) are mounted about the socket. At *pin 7*, C_2 and L_2 are connected for the filament voltage. Connected to C_1 is the ground end of grid parallel line L_1 and the grid bias resistance R_1. The grid coil is shaped like a very short hairpin loop. The screen grid voltage dropping resistance R_2 and the bypass condenser C_4 connect to *pin 1*.

The photograph of the top view of the socket shows the method of by-passing the external screen grid contact ring. A brass strip shaped as a ring clamps to the screen grid when the 4X150A is placed in the socket. The ring is bypassed to ground by four silver mica condensers (*C3*) soldered to the brass "ground plane". Notice the eight tapped holes about the outer edge of the mounting plate by which the plate resonator is mounted.

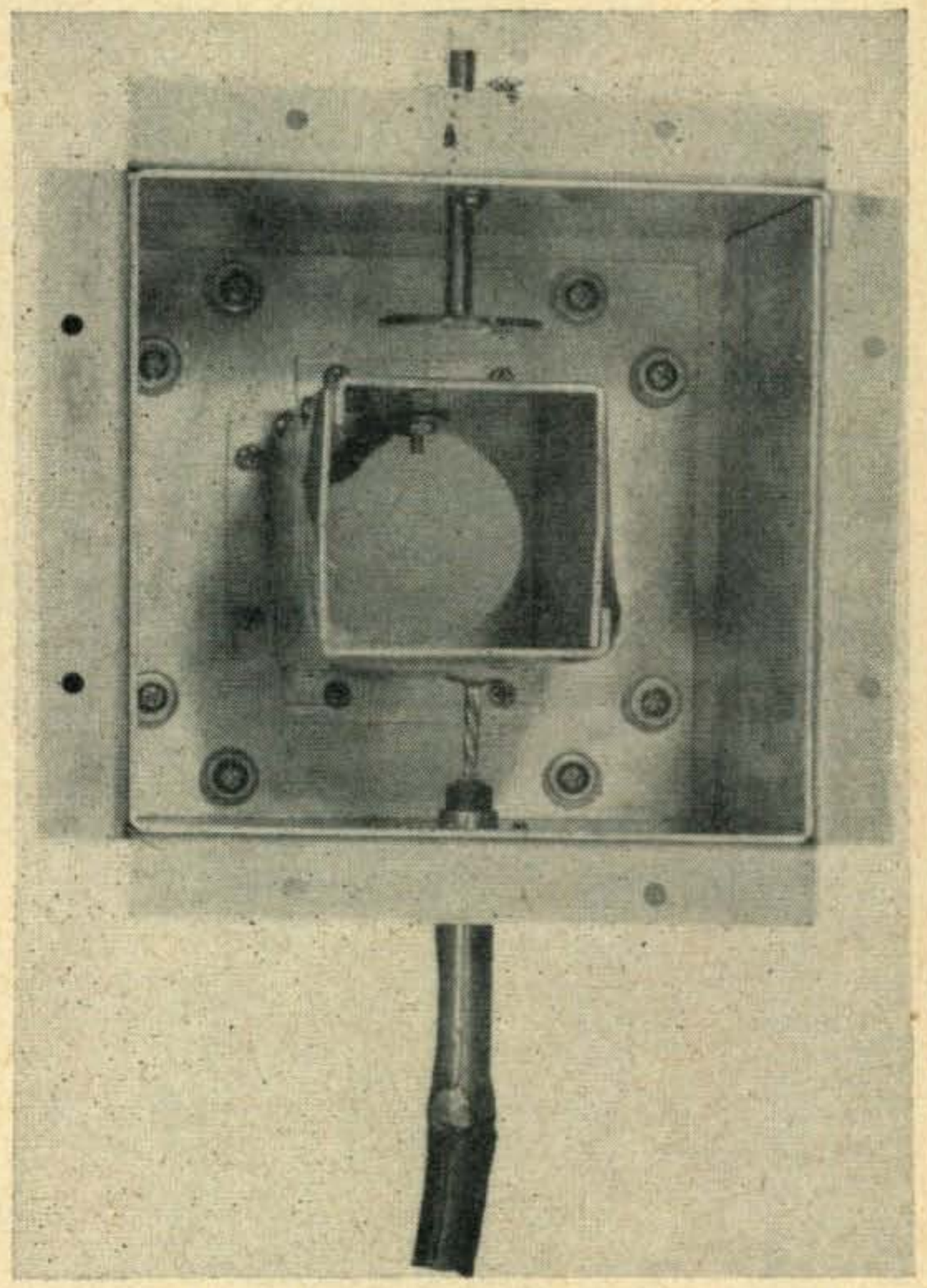
Details of the plate coaxial resonator in *Fig. 3* show the method of assembly and the necessary dimensions. The outer conductor is made of one sheet of aluminum with machine screws holding the overlapped edge firmly in place. No thinner wall stock than 0.051" should be used. Under operating conditions it is easy to detune the resonator by pressure exerted on the outside walls if they are thin and flimsy. The inner and outer conductors are rectangular instead of round as it is common to see coaxial lines. There is no noticeable difference in circuit operation when rectangular conductors are used. The inner conductor is constructed so that the external anode of the 4X150A will fit snugly within the open end. This method of contacting the plate is sufficient for both d.c. and r.f. voltages in the circuit.

The plate blocking capacitance *C5* is made of the *end* plate, *back* plate, and a sheet of teflon or mica dielectric. Teflon is a relatively new plastic material available in sheets as thin as 0.003" and flexible as a sheet of paper. It has a dielectric strength of 450 volts per mil, and its dielectric constant is about 2 with a very low loss factor at UHF.

Fiber insert washers which fit into enlarged holes in the *end* plate serve to insulate the anode voltage from the machine screws which thread into the *back* plate. Condenser *C5* is, therefore, a sandwich type of condenser with the teflon bolted between the *back* and *end* plates. Machine screws mounting the inner conductor to the *end* plate should be filed smooth with the surface of the *end* plate which is placed upon the surface of the teflon to avoid puncturing the dielectric.

The tuning disk (*C6*), 1" in diameter, is soldered to a machine screw and threaded through a brass block, which is mounted on the outer conductor. The disk faces one of the flat surfaces on the inner conductor near the end into which the anode fits. On the opposite side of the outer conductor is another brass block, *Fig. 5*, for holding the output probe in the desired position for coupling power from the circuit.

The output probe and the method of connecting it to the coaxial transmission line are shown in



The plate resonator from the tube end of the circuit with plate blocking capacitance on the back wall. The tuning capacitor is at the top and the antenna coupling disc attached to the coax cable is at the bottom.

Sheets of Teflon in dimension and thickness suitable for use with this transmitter are available from the CQ Editorial offices at 75c per order. Please enclose your remittance with order.

Fig. 4. The outer braid of the RG8/U is stripped off several inches from one end and replaced with a short length of brass tubing which is soldered to the remaining braid. After the disk is soldered to the center conductor, the unit may be slipped through the 3/8" hole in the output coupling clamp of *Fig. 5* which is mounted to the outer conductor. The coupling can be easily adjusted and then locked in the desired position. A clamp similar to that of *Fig. 5* is used to hold the tuning disk in place. Instead of a 3/8" center hole, a smaller taped hole is placed in the clamp to enable the screw which is soldered to the disk to be locked in position after the circuit is tuned.

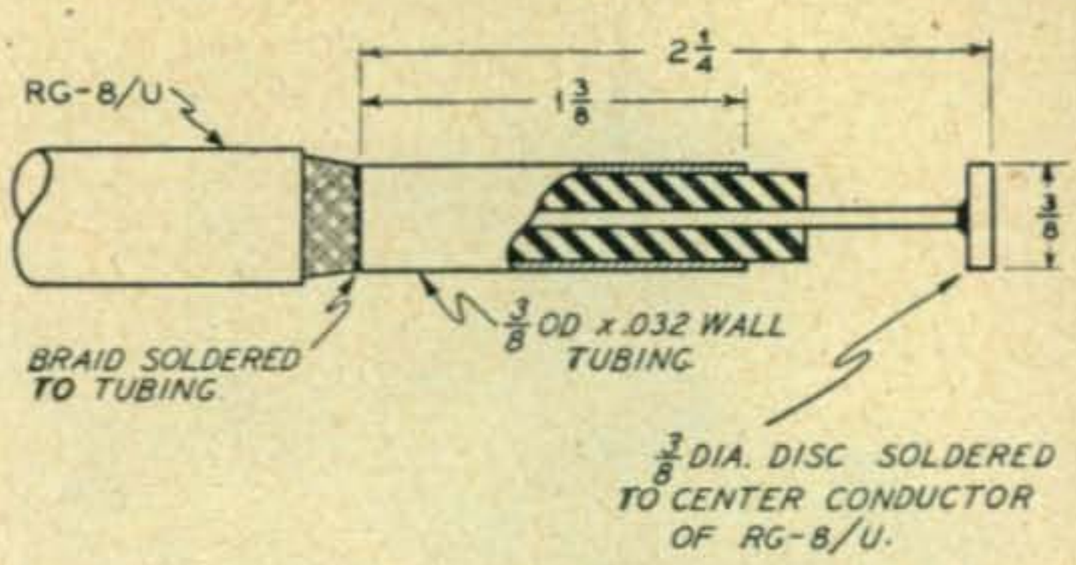


Fig. 4. The output coupling probe.

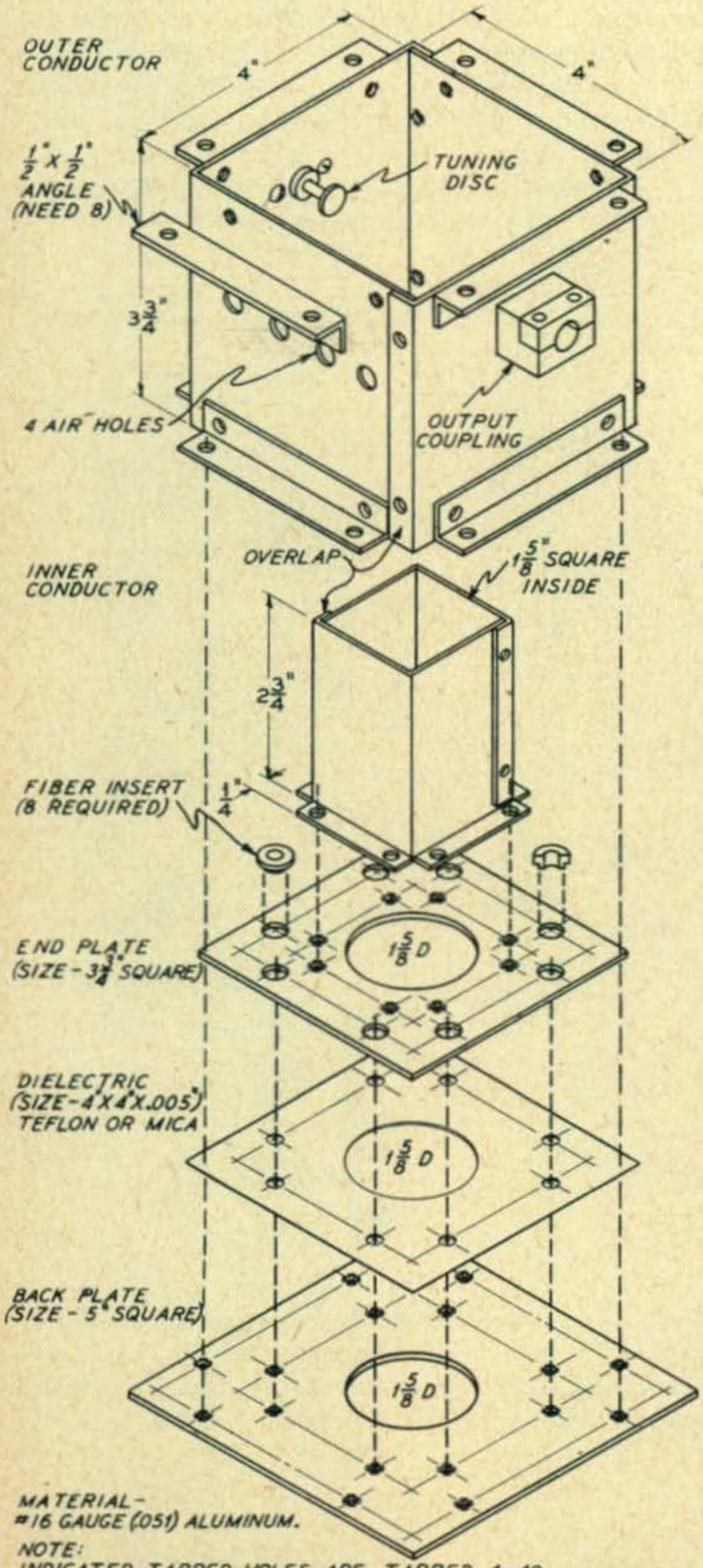


Fig. 3. Exploded view of the coaxial circuit element.

TABLE I*
General Characteristics of the 4X150A

Heater Voltage	6.0 volts
Heater Current	2.6 amps
Minimum Heating Time	30 sec
Average Interelectrode Capacitances:	
Grid-Plate	0.02 μμf
Input	16.1 μμf
Output	4.7 μμf
Maximum Ratings (frequencies up to 500 mc) Class C Telegraphy:	
D.C. Plate Voltage	1250 max volts
D.C. Screen Voltage	300 max volts
D.C. Grid Voltage	-250 max volts
D.C. Plate Current	250 max ma
Plate Dissipation	150 max watts
Screen Dissipation	15 max watts
Grid Dissipation	2 max watts

NOTES:

1. Maximum permissible grid circuit resistance, 25,000 ohms.
2. Due to transit time back heating effects, the heater voltage should be reduced at UHF. At 500 mc the heater voltage should be approximately 5.2 volts under typical operating conditions.
3. At 150 watts plate dissipation, a minimum flow of 5.6 cu ft of air per minute must be passed through the plate cooler. Forced-air cooling of the base terminal assembly must be provided. In no case should the temperature of the base seals be allowed to exceed 150 degrees C.

TABLE II
4X150A Tripler Power Amplifier Operating Conditions

Grid Current	Plate Voltage	Screen Grid Voltage	Plate Current	Power Output
10 ma	500 v	Dropping Resistor	150 ma	20 w
10 ma	1000 v	Bleeder (270 v)	200 ma	50 w

**Eitel-McCullough, Inc.*

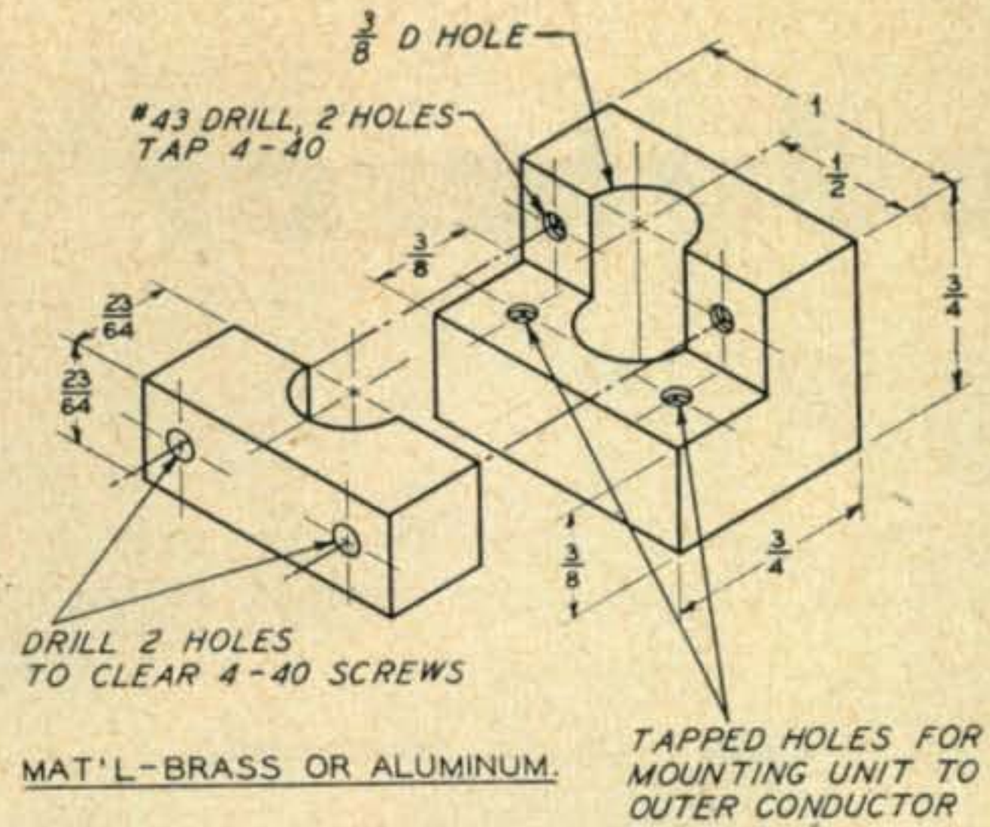


Fig. 5. The clamp for retaining the coupling probe.

Since the potential of the inner conductor is above ground by the plate voltage, a sheet of teflon has been wrapped about the inner conductor to prevent shorting the plate voltage to ground by the tuning disk or the output coupling probe. Other methods, such as facing the tuning disk and coupling probe with an insulating material, will give equal plate voltage isolation.

The method of constructing the coaxial resonator has many variations. Many other designs will work equally as well, or even better. A resonator constructed entirely of brass with all seams and edges soldered appeared to be only slightly more efficient, but not enough to warrant the use of brass over aluminum. However, silver-plated brass might result in as much as a 10% increase in power output.

Over a period of time, surface corrosion on the aluminum may cause increased losses and thus lower operating efficiency in the resonator. It may be necessary to periodically clean the surfaces which are held together only by machine screws. Care should also be taken in highly humid, salt corrosive atmospheres.

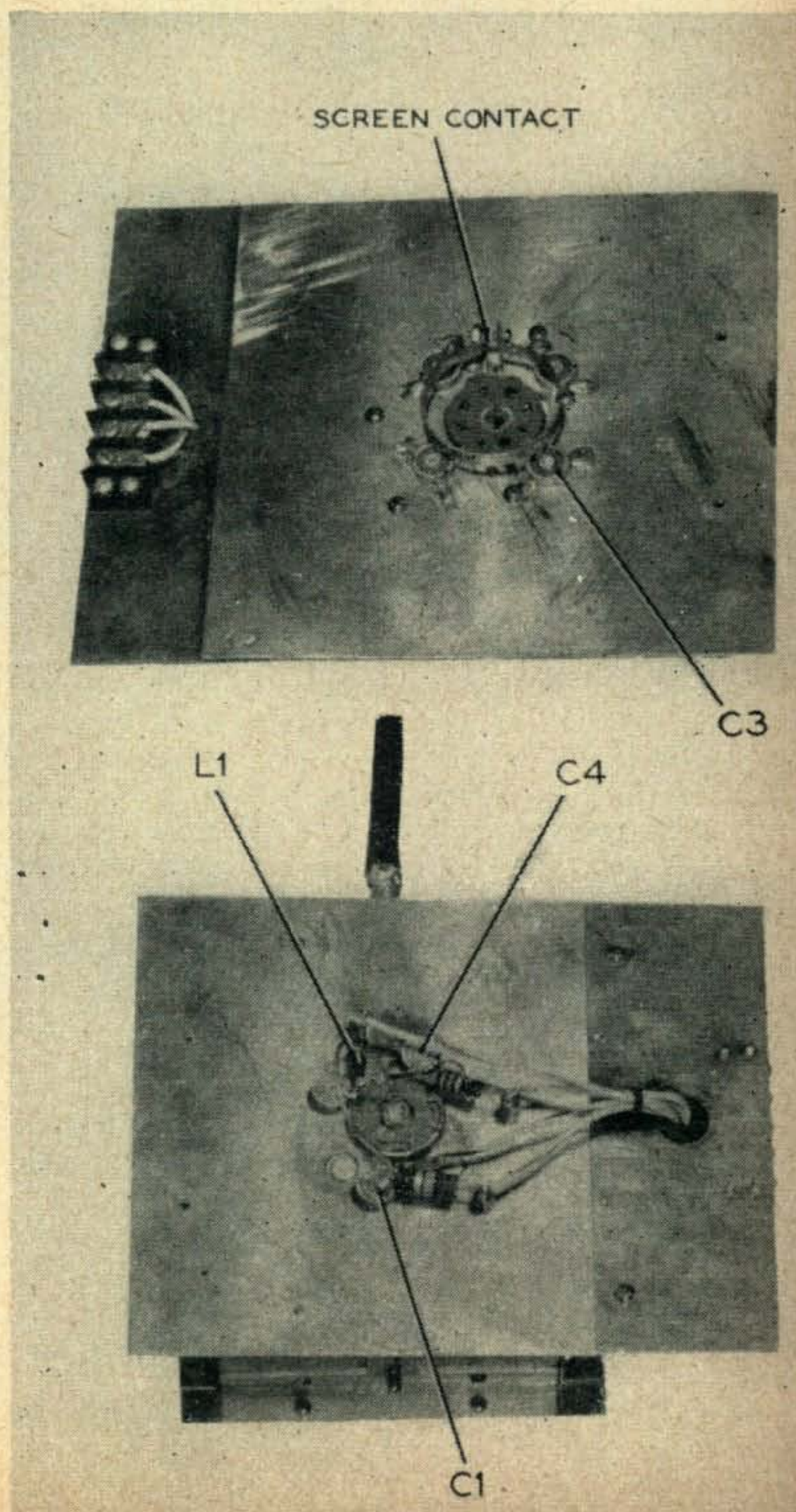
Operation

The filament voltage should be held at six volts or slightly less. At frequencies between 400 and 500 mc, back heating effects of the 4X150A will help keep the filament at the desired operating temperature.

With the filament voltage applied to the tube, a blower motor should be also in operation for cooling the glass seals of the 4X150A. The cooling air can enter the resonator through the back plate and pass through the center of the inner conductor, through fins built into the external anode of the 4X150A, pass over the glass seals of the tube and exit through four holes in the top of the resonator. This air also cools the anode whose maximum dissipation is 150 watts.

The grid is coupled to the output of a two-meter transmitter for a grid current of 10 ma. This will provide sufficient r.f. driving voltage to obtain a reasonable plate efficiency which will be far above the efficiency usually obtained by amateurs at UHF. On applying plate voltage and tuning for resonance in the coaxial resonator, a plate current dip of about 20 to 30 ma will be observed if the circuit is unloaded. To load the circuit, the probe is moved closer to the center conductor to give more capacity coupling. Of course, each time the capacity coupling is changed the circuit must be retuned. If desired, a small loop may be used for coupling to either a balanced or a coaxial transmission line. The loop should be placed in the circuit near the end plate in order to couple energy from the magnetic field.

(Continued on page 67)



UPPER—Top view of tube socket mounted on the "ground plane" in which the four silver mica condensers clamp to the screen grid of the tube. The eight tapped holes about the edge of the plate are used to mount the coaxial resonator.

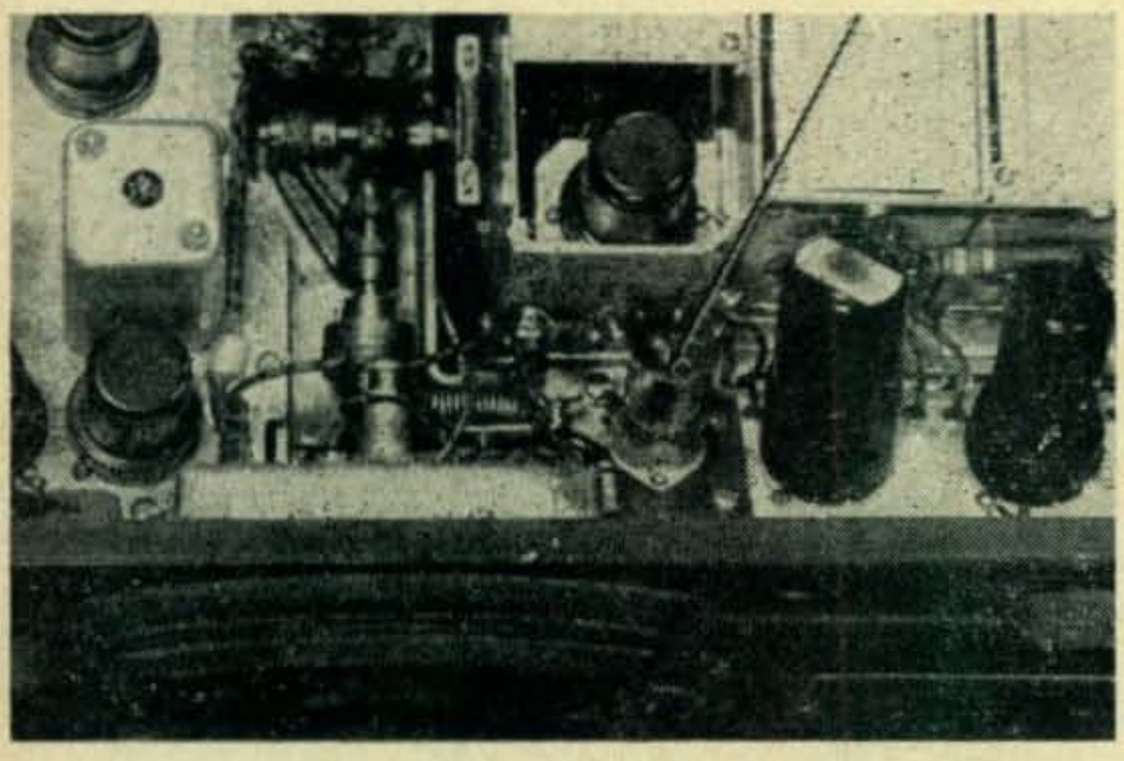
LOWER—Bottom view of loctal tube socket with grid resonant coupling line and the brass ring closely surrounding the socket to which the cathode pins are soldered.

The Useful Diode Modulator

ROBERT H. WEITBRECHT, W6NRM/9*

Maybe we are jumping the gun, but here is something especially important to the RTTY gang with possible application in remote receiver tuning and NBFM. —Editor.

There are various methods of achieving frequency modulation of a r.f. carrier, including the quadrature and Miller Effect modulators, mechanical devices varying oscillator inductance or capacitance, and switching of a capacitor across the oscillator frequency determining element.



The diode modulator may be conveniently installed in a BC-348 receiver by mounting it on a small plate just behind the main tuning dial.

Electronic Tuning of a Radio Receiver

The diode circuit may be used with advantage in the high frequency oscillator section of a communications receiver. One may tune the receiver from any distance by adjustment of a voltage on the connecting line. This application has been found to be a great convenience in radioteletype reception, as the operator can sit before his machine and watch the operation as he tunes the receiver remotely with a potentiometer mounted on the teletype table.

Collins Diode Modulator

The diode modulator as used in the Collin 709D-1 frequency shift exciter is basically of the type that switches a capacitor across the frequency determining element. Of course, the switching could be done simply through a switch (or relay) as shown in

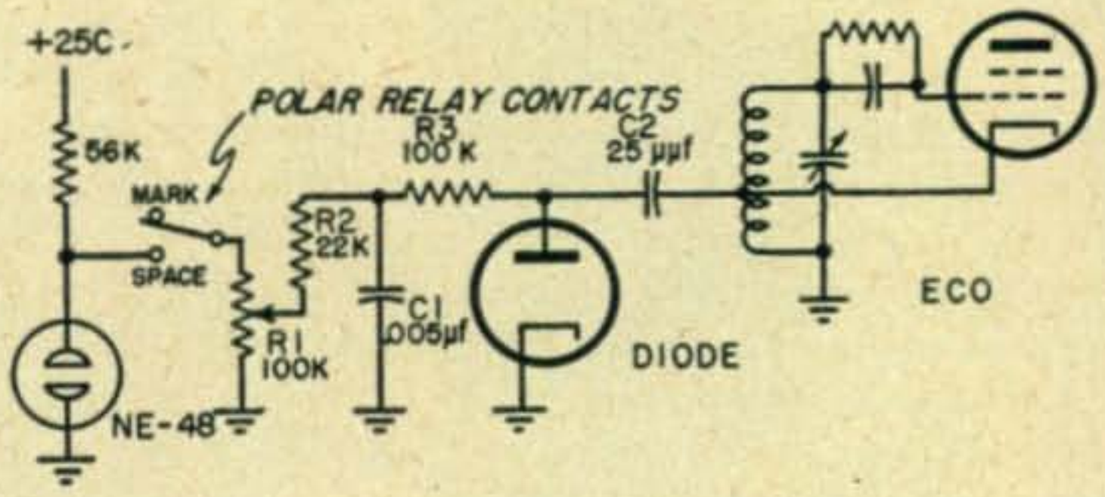
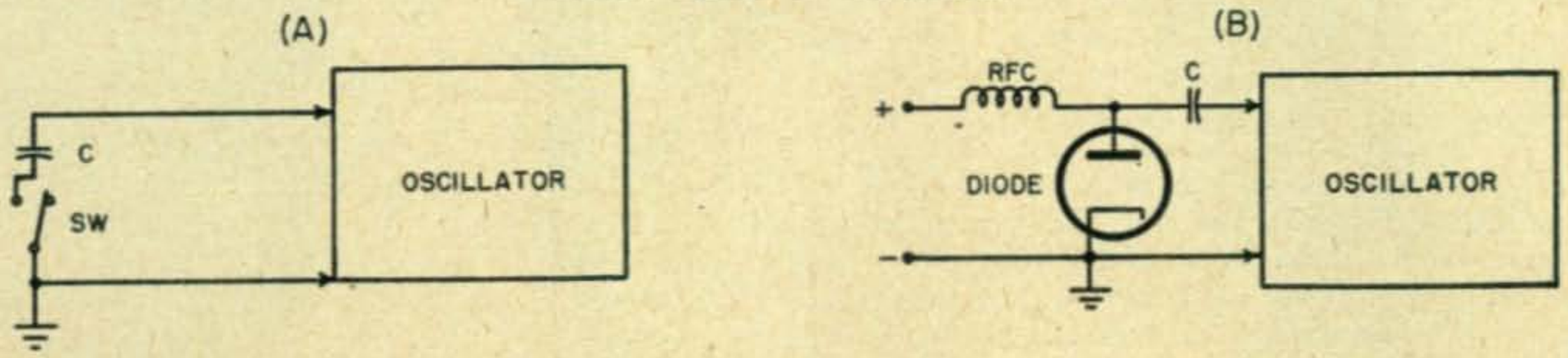


Fig. 2. A useful application of the diode modulator appears in conjunction with RTTY.

Fig. 1-A. The obvious disadvantage is that the switch must be placed so that short leads result between it and the rest of the circuit, especially when the oscillator frequency is high. Or, putting it another way, if the frequency shifting capacitor C is small compared to the possible wiring and switch capacity (when switch is open), the frequency shifting capability of the circuit is impaired by the resultant "swamping" of C by the extraneous circuit capacities.

The Collins circuit achieves immunity from wiring capacitance effects through the use of a diode in place of the switch as shown in *Fig. 1-B*. Ap-

Fig. 1. (a) Basic switching idea for varying the oscil lator frequency. (b) The Collins circuit which uses a diode in place of the switch.



*Yerkes Observatory, Williams Bay, Wisc.

plication of a direct current to the diode generates the desired frequency shift. The diode can be a 6H6, 6AL5, a triode with grid and plate connected together, or even a germanium crystal diode such as a 1N34. The r.f. choke serves to isolate the diode-capacitor circuit from the input circuit as far as r.f. is concerned and permits the direct current to exert an effect upon the diode circuit. Thus the input circuit can be any distance from this basic diode circuit and yet permit frequency shift without difficulties due to the length of the line. The current required is only a few milliamperes.

This circuit is applicable for use with either crystal or self excited oscillator circuits. However, there is a factor that determines the amount of shift available from a given oscillator circuit using the diode circuit—the Q of the frequency determining element. In the case of a crystal oscillator the Q of the crystal is so high that the available shift is quite limited, being of the order of 100 to 200 cycles at 2 megacycles. The crystal oscillator modulator is thus usable for radioteletype work on the higher frequencies, to which multiplier stages can be used to multiply the crystal frequency and its shift.

When the diode circuit is used with a self-excited oscillator, such as a VFO in a transmitter, the shift is much larger because the oscillator tuned circuit Q is lower. Seven, ten, or more kilocycles of shift on 3500 kc are easily achieved thus opening up further possibilities. For illustration, two applications will be shown and described.

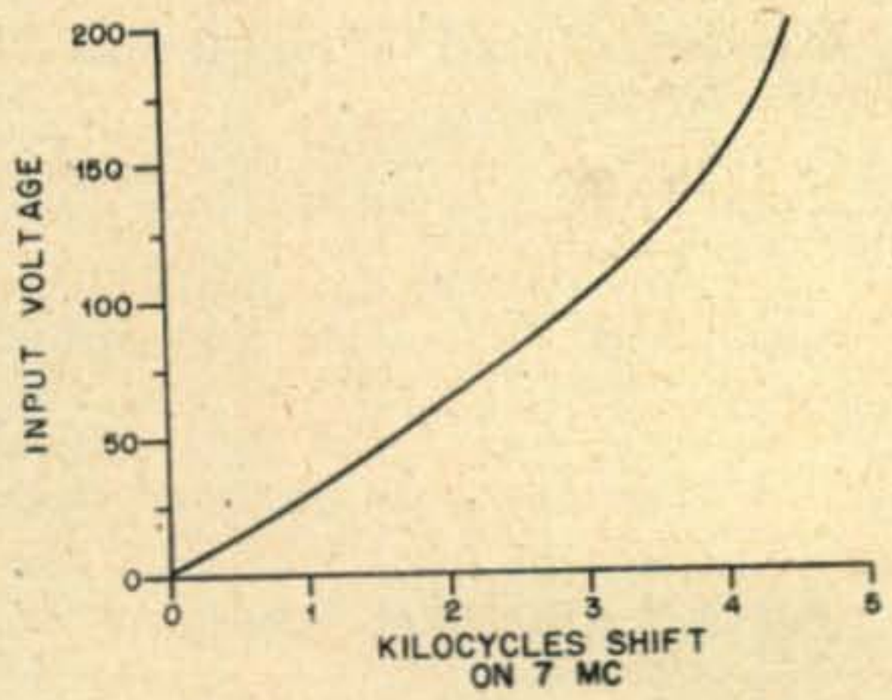


Fig. 3. Approximate shift to be expected from the use of the circuit in Fig. 2.

FSK of a VFO

The circuit shown in *Fig. 2* is used for generating a frequency shift of a value usable for transmitting intelligence over a radioteletype circuit. This has been described in some detail in an article on Radioteletype[1].

The required signal is generated by the sending contacts of a teletype machine and is so set that the transmitted carrier is shifted from one frequency to another — usually 850 cycles. For example, the *space* frequency (switch closed in diagram) could be on 7100.00 kc. Now if the switch is opened to the *mark* side, the resulting frequency is increased to 7100.85 kc. Feeding a combination of *mark* and *space* impulses into the circuit thus results in a frequency shift keyed signal, called FSK for short; or, as FCC defines it, *F-1* emission.

Going into details of the circuit, the neon lamp *NE-48*, is employed as a voltage regulator to establish one voltage level with respect to ground, a necessity for a stabilized frequency shift unit. The voltage from this neon lamp feeds into potentiometer *R1*, via the polar relay contacts, the latter being the agency that keys the circuit. The potentiometer is used as a voltage divider and permits control of the available shift. The resistors, *R2* and *R3*, and the capacitor *C1* serve two purposes; one is to "soften" the rectangular waves being fed into the diode and thus minimize the generation of extraneous sidebands which would cause clicks and interference to adjacent channels. The secondary purpose is to isolate the diode from the input circuit for r.f., the same effect being given by the r.f. choke of *Fig. 1-B*. This is to show that it is only desired to have an *impedance* between the input and the r.f. circuit, and either a r.f. choke or a resistor will serve, depending upon the application.

The oscillator circuit shown is an electron coupled oscillator circuit as used in a portable transmitter. Here the frequency shifting capacitor *C2* is placed between the diode and the cathode tap of the ECO. Certainly the capacitor could be connected to the grid end of the coil, resulting in a greater frequency swing. However, the cathode tap permits sufficient froquency shift for radioteletype communication work. Condenser *C2* may be a mica or ceramic type, or a stable variable trimmer capacitor.

Using this diode circuit, a relation between voltage input (potentiometer turned all the way up) and radio frequency shift is shown in *Fig. 3*. To an extent, the amount of shift available depends upon two factors; the value of the series capacitor *C2* and the current through the diode, set by the input voltage fed through the resistor network. For a given oscillator circuit, a certain combination of the two factors yields an optimum condition. In general it may be stated that the diode frequency shift circuit is applicable for the generation of a shift of the order of a few kilocycles on the high frequencies.

The circuit is presented in *Fig. 4* with its potentiometer control and smoothing network, as worked into the writer's BC348 receiver. A diode connected 6C4 is mounted on a shelf adjacent to the oscillator can (see photo). A small 5 $\mu\mu$f ceramic capacitor bridges the diode plate to the "hot" (grid) end of the oscillator coil. At the control end, the potentiometer is fed by a regulated voltage supply, which could be in the receiver itself or external.

The calibration of the high frequency oscillator is shifted slightly, but is readily restored by adjustment of the trimmer used for frequency setting

[1] "Radioteletype" by Wayne Green, *CQ*, Dec. 1951.

of the oscillator. The overall receiver stability is unaffected by the addition of the diode circuit.

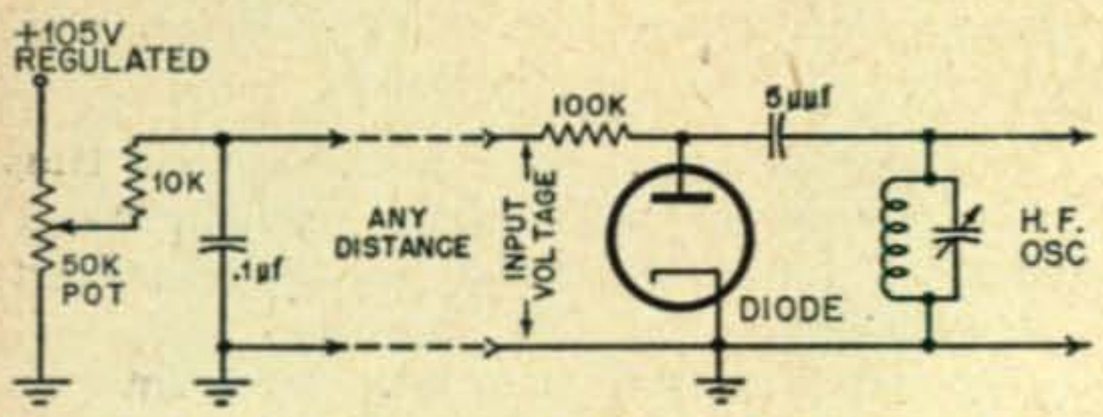


Fig. 4. Wiring schematic for the diode modulator shown in the photograph.

Figure 5 shows the tuning range of the electronic tuner on the 7 megacycle band. The two curves shown are for two different diodes—the 6C4 mentioned above and a 1N34 crystal diode. It shows the possibility of a vernier tuning system which can be easily built into any existing receiver and would be of great aid in the reception of sharp tuning signals, such as single-sideband and radioteletype. Even c.w. men would find this system an invaluable aid in tuning for different stations in a net, whose frequencies may not zero beat. Referring to the shift-versus-voltage curves, it is noted that the curve, using the 1N34, is substantially linear over a greater frequency range than the vacuum diode curve.

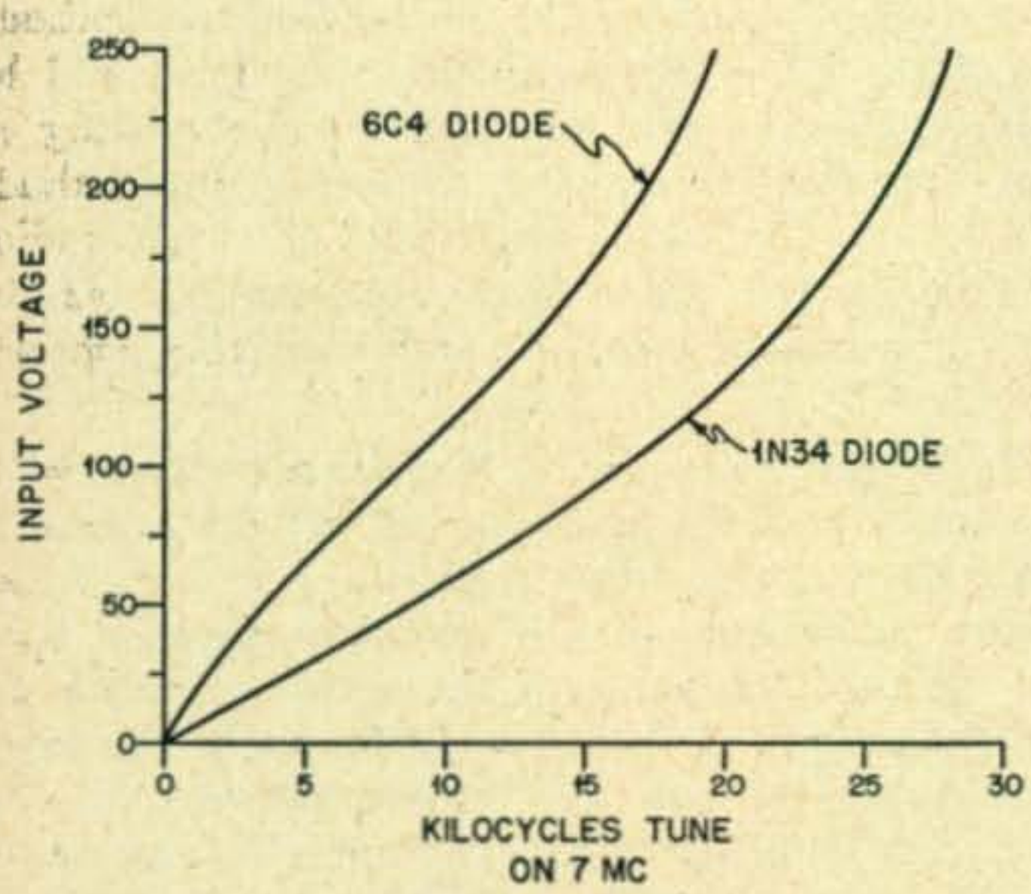


Fig. 5. Tuning range at 40-meters for the BC-348 and the diode modulator.

Other Applications

Judging by the linearity of frequency shift-versus-voltage curves shown in *Figures 3 and 5*, the idea of using the circuit for NBFM radiotelephony presents itself. A suggested circuit in *Fig. 6* shows essentially an amplifier and a diode modulator in one tube envelope, such as a 6SN7GT type double triode. However, a 6J5 and a 1N34 could be used if desired.

A variety of microphones, with or without preamplifiers, could be used with this circuit and would give good quality NBFM. Possibly through the addition of a 1N34, a small capacitor, and a resistor only to the oscillator section of the transmitter, and connecting the diode circuit directly to the

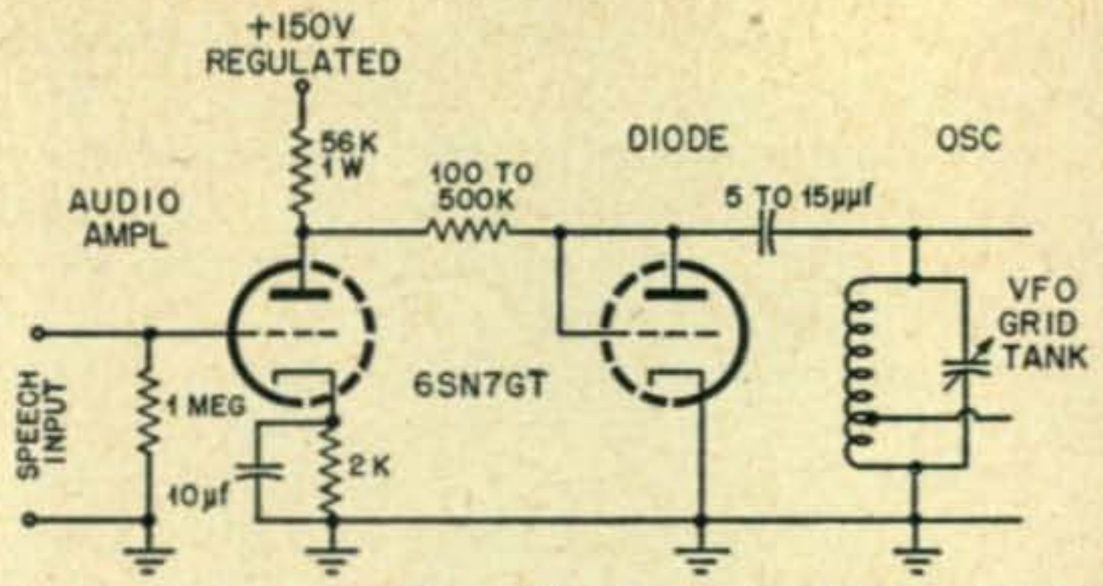


Fig. 6. Just an idea the author has not tried for NBFM.

plate of the last audio preamplifier stage and ground, would give identical results. There must be *no* bypass condenser between the plate of the amplifier and the input to the diode modulator, as the d.c. voltage on the plate of the amplifier is a necessary part of the functioning of the modulator. It is left to others to evaluate the performance of such circuits for radiotelephony and other uses.

In this connection it is mentioned that the 1N34, if used, is polarized and must be properly connected just like the cathode and plate of the original vacuum diode circuit.

In conclusion, there seems to be quite a few other uses for the basic diode modulator—these are left to the reader's imagination. The fact that the circuit performs and is serving very well in the original Collins circuit and elsewhere should make it worthy of more widespread usage.

Present and Prophetic

(from page 6)

models. The Saturday night meeting will concern Civil Defense. Breakfasts will be conducted for the major groups; phone nets, CW ops and YL's.

Details available over the air or by writing to W7FBA. Admission will be $6.50 for hams and $2.50 for XYL's.

FRESNO AMATEUR HAMFEST

The Tenth Annual Hamfest of the Fresno Amateur Radio Club will be held on Saturday, May 3rd at the Fresno Memorial Auditorium. The program this year will be well-rounded with plenty of entertainment, prizes, dinner and other activities. Pre-registration tickets are available at $4.00 each from Mr. Grant Storey, 908 W. Pico, Fresno, California.

ROCHESTER ASSOCIATION HAMFEST

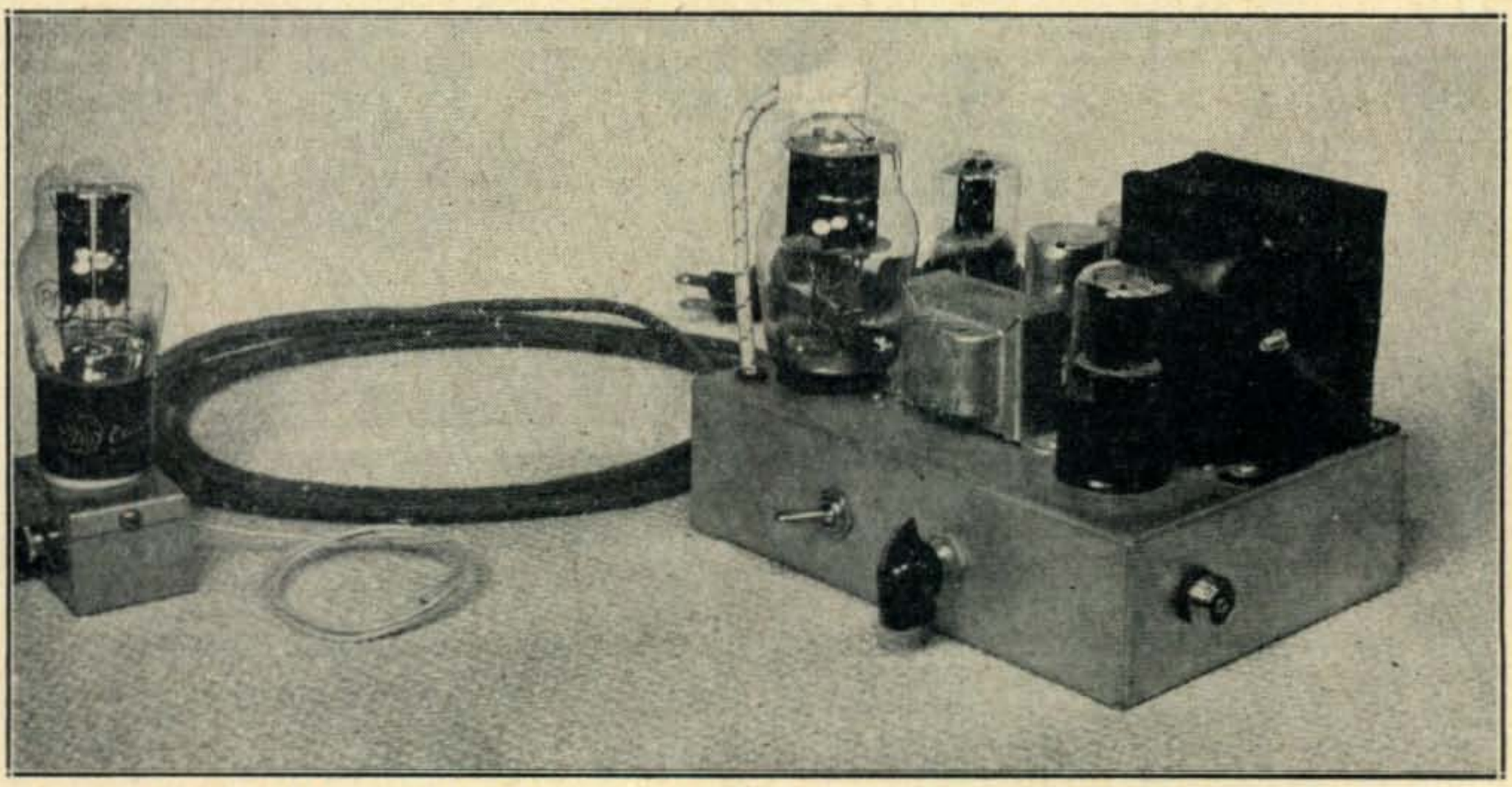
On Saturday, May 10th the Annual Hamfest of the Rochester Amateur Radio Association will be held at the Rochester Elk's Club. Some very interesting technical talks and discussions are scheduled for the afternoon session with simultaneous entertainment for the XYL's. The Dinner will be followed by more entertainment and a well-known guest speaker. Advance registration and reservations obtainable from R.A.R.A., Box 1388, Rochester 3, N. Y.

Rothman System of Modulation

MAX I. ROTHMAN, W5PJI*

Every once in awhile a new idea is brought out in the amateur field that merits considerable thought and discussion. A few years ago it was the so-called "cubical-quad," today it is an engineering novelty called the "Rothman System of Modulation." It has been repeatedly demonstrated before large audiences and has attracted very favorable attention. On the other hand, it has been reviewed in contemporary press which creates some doubt as to whether the author's viewpoint and experiments have been fully described. At the author's request CQ has made available the following space for an original disclosure of this system. Publication should not be construed as an endorsement, but rather as a mode of presenting the full story to the radio amateur fraternity. —Editor.

The *Rothman System of Modulation* was invented by the author in January, 1951 for Marmax Electronics, Alamogordo, New Mexico. This system is a new method of achieving high efficiency amplitude modulation without the use of expensive and bulky high level modulation equipment. The system utilizes demodulated carrier feedback to control the angle of radio frequency flow of plate current in a pentode or tetrode r.f. amplifier tube in such a manner that screen modulation may be achieved without appreciable "efficiency modulation"; i.e., the angle of plate current flow is kept relatively constant throughout the modulation cycle. It is apparent that modulation is thereby achieved through control of the instantaneous tube impedance, and that any attendant "efficiency modulation" is caused only as the result of impedance variation, rather than modulation of the current flow angle which is the greater factor. With proper choice of impedance ratios, "efficiency modulation" in the *Rothman System* is reduced to a secondary factor.



The complete 1 Kw Rothman Modulator. At the left the r.f. rectifier and at the right the screen modulator and speech amplifier.

Theory of Operation

In the *Rothman System,* screen power for the radio frequency amplifier is obtained by rectifying a portion of the r.f. energy present in the tank circuit. It is evident that the r.f tube used must have a favorable ratio of screen power requirement compared to rated plate power output. If this condition is met and proper feedback ratio is employed, the stage automatically adjusts its plate current versus screen voltage ratio for optimum efficiency during each portion of the modulation cycle. This effect is caused by the fact that the point in the screen characteristic at which plate efficiency starts

*P.O. Box 75, Mountain Park, N. Mex.
Electronic Scientist, Hollomon AFB.

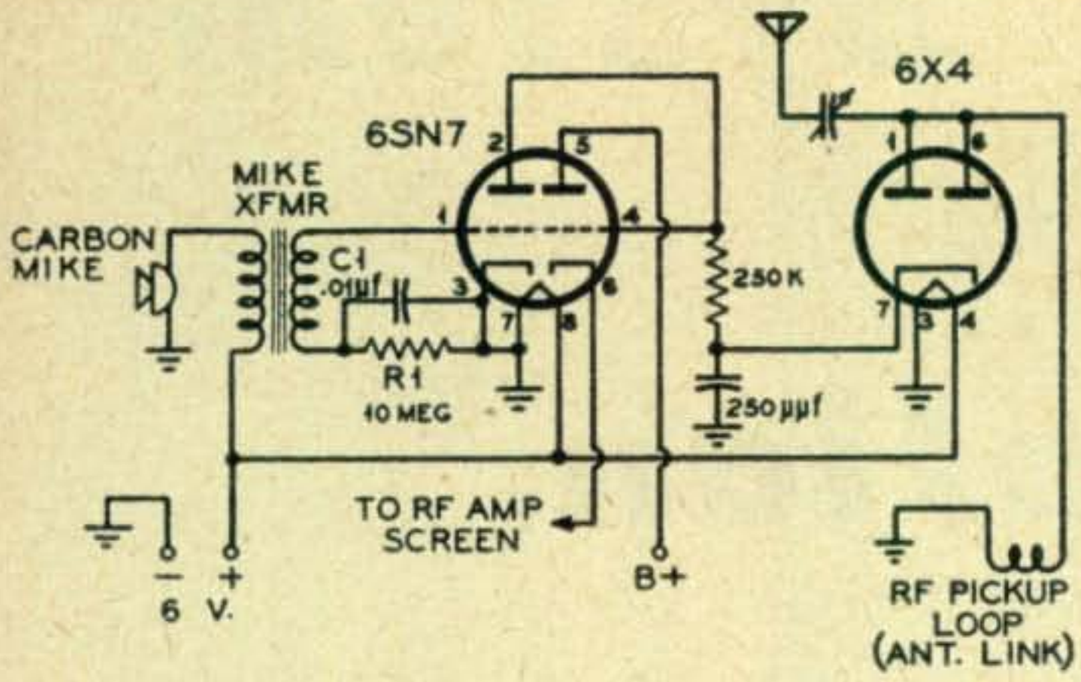


Fig. 2. A 1 to 100 watt modulator for mobile operation.

to decrease is essentially coincident with the point at which a further increase in screen voltage produces a proportionately smaller increase in output power. Control of this "automatic hunting effect" may be used as a means of varying the power input to the plate circuit of the radio frequency amplifier stage. In effecting this control, any convenient parameter may be chosen which initiates the desired instantaneous change in carrier level. At this point the regenerative feedback action of the system amplifies this change by a factor related to the screen grid transconductance of the tube. *Figure 1* embodies a circuit diagram of an improved *Rothman Modulation* unit wherein screen feedback control is conveniently accomplished by use of voltage divider action between the screen impedance and that of a modulated control tube. This particular embodiment has been chosen for its simplicity, versatility and excellent stability. Other methods of control, however, are entirely feasible; e.g., transformer coupling of control energy into any tube electrode. In *Fig. 1*, controlled carrier operation is achieved by means of *R1-C1* which charges to a grid bias level directly related to the modulating energy. Since this bias controls the average impedance of control tube *V1* and therefore the average ratio of screen feedback, it may be chosen to produce any desired controlled carrier characteristic. Constant carrier operation may be achieved by the insertion of a suitable cathode resistor and bypass condenser in the control tube circuit. Any intermediate degree of controlled carrier action may be achieved by suitably relating *R1-C1* with the cathode bias network.

Figure 2 embodies a *Rothman Modulator* circuit designed for mobile transmitter application and utilizes suitably smaller tubes. In this circuit a cathode follower is utilized to supply the screen power in order to prevent the consumption of any appreciable percentage of r.f. power in the screen feedback link. In general, it may be stated that with the circuitry illustrated in *Fig. 1* the r.f. amplifier tube must be chosen for relatively low plate impedance and small screen power requirements while the control tube similarly should be of low impedance in order that it may provide good control action at low screen voltage. It is important to note that since in the circuitry shown no audio is impressed on the plate supply, the plate voltage used should be equal to the sum of the d.c and a.c. components present in a high level modulated stage for a given tube. However, proper choice of low impedance tubes makes it entirely feasible to design *Rothman* modulated transmitters which operate at conventional plate voltages. The 6BQ6 and 6BG6 are typical tubes which meet the above requirements and which will operate up to 50 megacycles and even higher with reduced plate efficiencies. In this respect *Rothman Modulation* does not differ from other systems with the exception that as plate efficiency drops due to marginal frequency operation the amount of control energy is proportionately lower. For this reason *Rothman Modulation* does not operate advantageously with frequency multiplying stages. As in all controlled carrier systems, power supply regulation is important when used with *Rothman Modulation*. However, advantage of the controlled carrier duty cycle may be had by the use of large output capacitance in the power supply as a storage tank to decrease instan-

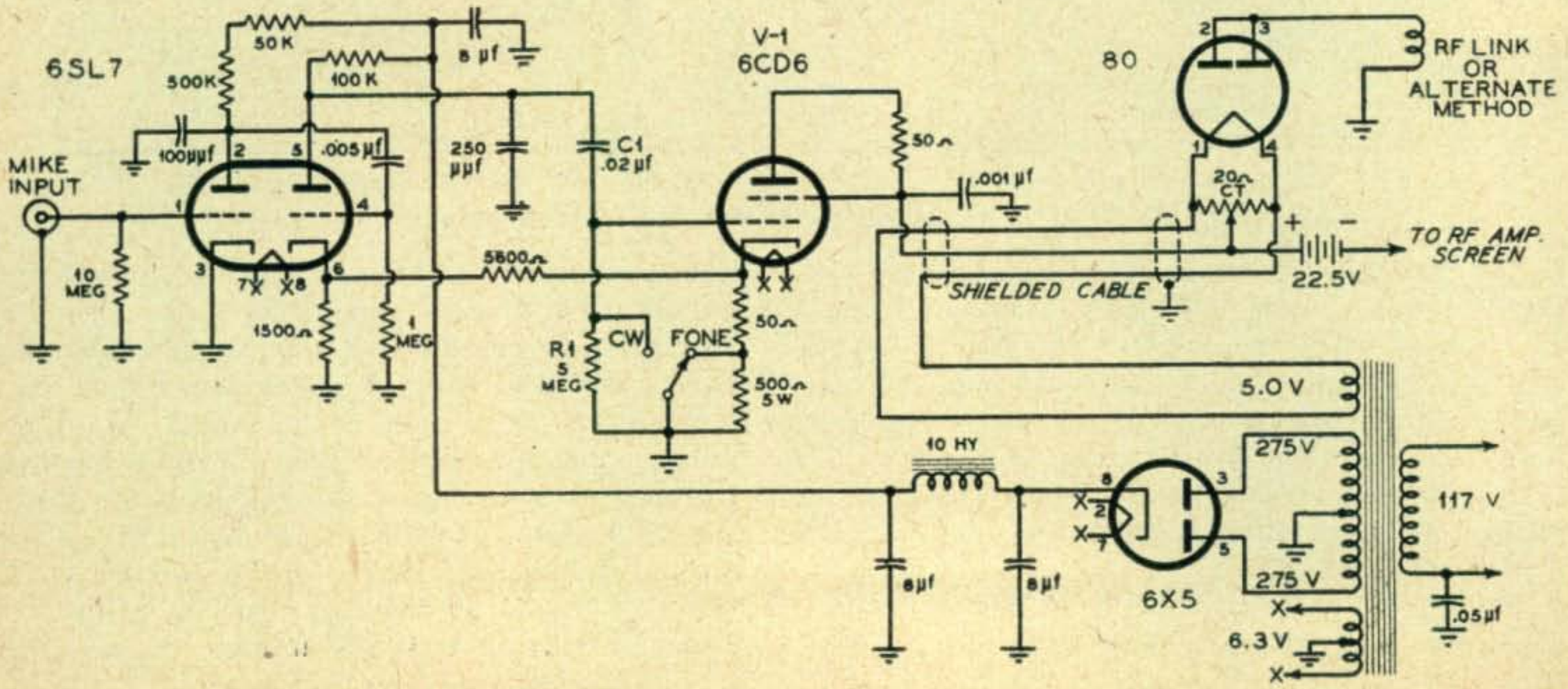


Fig. 1. Basic modulator for fixed station operation. This circuit will modulate up to 1000 watts.

taneous peak power requirements from the supply.

Efficiency Computations

The following data were taken for the modulation conditions shown in *Fig. 4*. The transmitter used a pair of Eimac 4-250A's in push-pull on the 20-meter band.

1. Input to the **Rothman** modulated class C stage at 100% modulation was 1000 watts d.c. power (5000 volts x 0.2 amperes) plus 500 watts a.c. power (audio component).
2. Output from the same stage to a 200 ohm non-reactive dummy load was 2.3 r.f. amperes. This computes to $(2.3)^2$ x 200 or 1058 watts.
3. Percent efficiency of this stage (And overall conversion efficiency) was therefore 1058/1500 times 100 or 70.5%.
4. Average efficiency of high level modulated class C stages as quoted in Terman's **Radio Engineering Handbook** is 66-2/3%.
5. Average efficiency of class B modulators as quoted in the same reference is 55%.
6. Thus to obtain 500 watts of sine wave audio power to 100% modulate 1000 watts of d.c. input to a high level modulated class C stage it is necessary to supply 500 x 100/55 or 909 watts of d.c. power to the class B modulator.
7. Thus, in a high level modulated stage with a d.c. input power of 1000 watts and a class C efficiency of 66-2/3%, the output power will be 1500 watts (1000 watts d.c. plus 500 watts audio) times 0.66-2/3 or 1000 watts. However, the combined d.c. input power of the class C r.f. and the class B modulator stages is 1000 watts (Class C) plus 909 watts (Class B) or 1909 watts.
8. The overall plate conversion efficiency in percent of such a class C r.f. and class B modulator combination is therefore 1000/1909 times 100 or 52.4%.

Comparison of the two Systems is as follows:

Class C stage efficiency with **Rothman** modulation is 70.5%.

Overall conversion efficiency with **Rothman** modulation is 70.5%.

Class C efficiency with high level modulation is 66-2/3%.

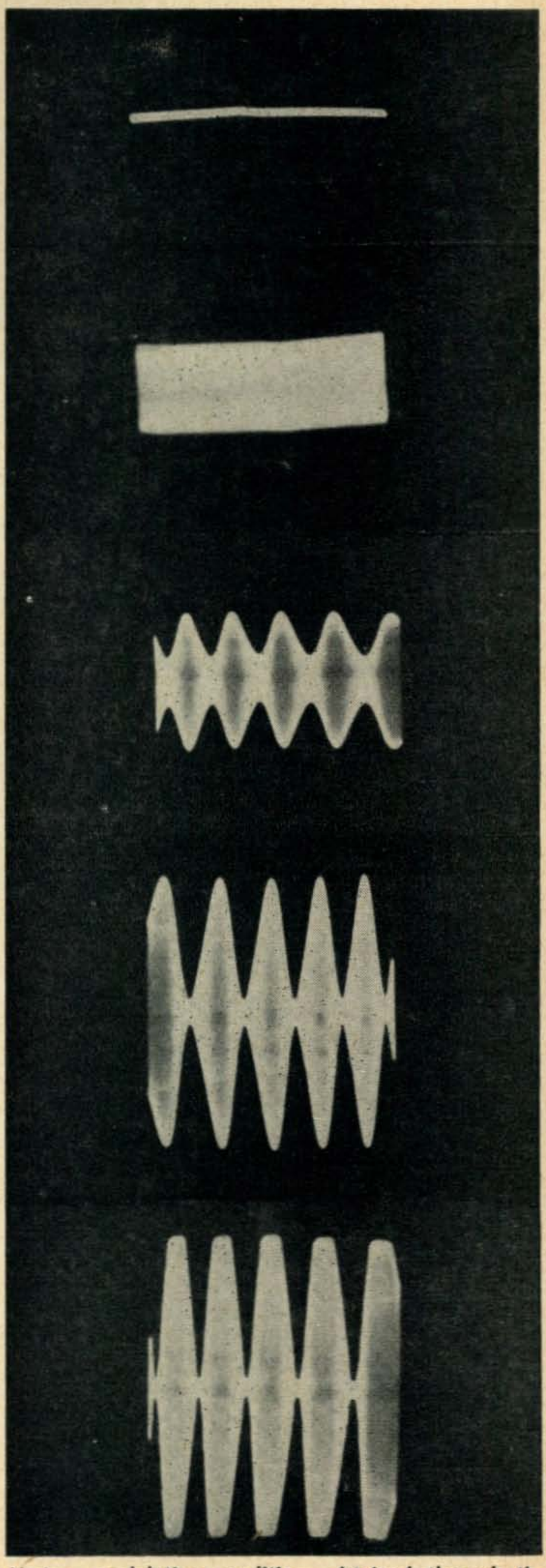
Overall conversion efficiency with high level modulation is 52.4 %.

Operation and Adjustment Procedure:

Plate voltage to class C stage must be adjusted to a least one and one-half times and preferably twice the manufacturer's rating for a high-level modulated stage. The screen by-pass condenser of the class C stage should not exceed 250 $\mu\mu$f for frequencies of 14 megacycles or above, 500 $\mu\mu$f for frequencies between 3 and 14 megacycles, or .001 μf for frequencies below 3 megacycles. The *Rothman Modulator* should be used as the sole source of screen power. Screen feedback under full modulation conditions should be adjusted to produce one-half the manufacturer's rated screen voltage for a high level modulated stage. This measurement should be performed with d.c. voltmeter possessing a sensitivity of at least 1000 ohms per volt.

Resonance adjustment should be made for maximum r.f. output current with the CW/phone switch *(figures 1* and *2)* in the CW position. As opposed to conventional systems, the *Rothman* modulated stage draws maximum plate current at resonance since no screen voltage is developed under off-resonance conditions. Care must be exercised not

(Continued on page 66)



Various modulation conditions obtained through the use of the circuit in Figure 1. From top to bottom: no carrier; carrier without modulation; undermodulated carrier; fully modulated carrier; and overmodulation.

Second Guessing the Experts on the HQ-129X

JOSEPH SANTANGELO, WINXY*

Nothing is more soul satisfying to the average ham than the feeling that he has been able to make a "terrific" improvement in his equipment. While a wonderful starting place would be the station receiver most modifications are a little too tricky to handle. But, here is the exception that makes the rule. This one is simple and foolproof with startling results. —Editor.

The greatest part of the noise generated in some communications receivers is caused by the mixer stage rather than the radio frequency amplifier(s). This is true primarily because the tube chosen as a mixer is one in which the screen current is several times that of the plate, and as such, it makes a rather good noise generator.

Most fellows are not particularly interested in working on their communications receiver unless the changes are relatively simple and do not require a lot of time or test equipment. This fact is one of the reasons for the enormous popularity of the pre-selectors and low-noise converters that have become so prevalent. It is not generally appreciated that these devices improve the signal-to-noise rather than increase the gain of the receiving system. This condition probably exists because of the manner in which the auxiliary equipment is used in the average amateur communications system. The converter or low-noise radio frequency amplifier is generally designed for one or two bands using a more modern approach in design, techniques, and components than were available to the communications receiver manufacturer several years ago. The original receiver is then used as an i.f. strip with the sensitivity control set so that, although the overall gain may be the same or slightly greater than before, the actual gain is reduced along with the noise generated by the receiver.

The problem of obtaining the best signal-to-noise ratio is common to most phases of the radio art, but it is probably closest to the amateur problem in the field of television. The rapid advancement of television in the past several years, although frequently presenting a problem to the ham with TVI, has forced the development of new tubes to meet the demands of the industry. Several of these tubes may be used to great advantage by the amateur. Tubes such as the 6BQ7 and 6BK7 may be used in "cascode" amplifier circuits for which they were primarily designed. For improved mixer service, tubes such as the 6X8 and 6U8 are remarkably well suited.

All the above-mentioned types have been designed to work in equipment up to 220 megacycles and are of the miniature 9 pin base construction. The 6BQ7 and 6BK7 are double triodes and they differ primarily in the method of construction, the 6BQ7 having a slight edge over the 6BK7 at the higher frequencies. The 6X8 and 6U8 are a combination of a triode and pentode in a single envelope. They are both designed essentially for mixer service; the 6X8 has a single cathode whereas the 6U8 has separate cathodes for the triode and pentode sections. Both types exhibit a 3 to 5 times increase in conversion transconductance (G_c) over the conventional type mixers such as the 6K8, 6A8, 6A7, etc. The 6X8 is similar to a 6J6 with a screen and suppressor added to one section, whereas the 6U8 approximates a "souped up" 6AB4 and 6AG5. The 6X8 was chosen for the modification described below simply because of its single cathode requiring less parts.

The equivalent noise resistance of various tubes used for radio frequency amplifiers and mixers has been tabulated * and the figure for the 6K8 is 290,000 ohms. Calculations for the 6X8 yields an equivalent noise resistance of 2650 ohms, better than 100 to 1 improvement plus the fact that the manufacturer's ratings indicate a G_c of 350 micromhos for the 6K8 and 1600 micromhos for the 6X8. The above figures indicate a theoretical improvement in signal to noise of 20 db and a 5 to 1 increase in conversion gain. Of course, this does not tell the complete story as to input loading, or requirements for proper matching, but it was decided that a very noticeable improvement should result if the 6X8 was substituted for the 6K8 in the HQ-129X receiver.

A few limitations were established in the consideration of design changes in order that the modifications could be accomplished by most hams with a minimum of effort. These were as follows:

1. *Do nothing that might require alteration of the r.f. or i.f. coils or switch decks.*
2. *Use as many of the original parts existing in the mixer circuit as possible with a minimum of new parts.*
3. *The changes should not require any elaborate test equipment for realignment, etc.*

Modifying the Mixer

With the above considerations in mind, a review of the schematic of the HQ-129X led to the modified

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*194 Barbara Road, Waltham 54, Mass.

circuit shown. A comparison of this with the original shows that three parts (one resistor and two condensers) are eliminated, and four new parts are added. The 240 ohm resistor, .05 uf and 4700 uuf condensers connected to *pin 8* in the cathode circuit of the 6K8 should be removed from the chassis. The four new components consist of a 5100 ohm 1 watt resistor, a 1 uf 400 volt paper condenser, a 22 uuf mica condenser and a 3 uuf ceramic zero temperature coefficient condenser.

Remove the existing 6K8 socket from the chassis, by drilling out the rivets and push it to one side, but do not remove any of the wires connected to it at this time. Then cover the hole with a rectangular piece of aluminum, copper or brass on which a 9 pin socket has been mounted with *pins 1* and *9* facing the side of the chassis away from the coil compartment.

Tie *pins 1, 6* and the center shield together and to ground. Then ground *pin 4* with a separate wire.

Disconnect the two resistors from *pin 5* on the 6K8 socket and reconnect them to *pin 2* of the new socket. Also connect the 3 $\mu\mu$f ceramic condenser (new) from *pin 2* to ground as indicated in the modified schematic. This condenser should have short leads and be arranged so that it is close to the chassis.

The wire that was on *pin 6* of the octal socket should be removed and tied to *pin 3* along with one end of a 22 uuf mica condenser (new), the other end of which is connected to the junctions of the 22 ohm and the 4700 ohm resistors in the grid of the mixer.

The heater wire should be removed from *pin 7* of the old socket and connected to *pin 5* on the new socket.

It is necessary to remove from the tuning condenser compartment the 22 ohm and 4700 ohm resistors that are in the grid circuit of the mixer. They should be reconnected underneath the chassis using the existing feed-thru for the junction of the 22 ohm, 4700 ohm resistors and the 22 $\mu\mu$f mica capacitor. The other end of the 22 ohm resistor should be connected to *pin 7* on the new socket.

The end of the 2200 ohm resistor and the .02 μf by-pass condenser on *pin 4* of the 6K8 socket should be removed and connected to the screen grid, *pin 8* of the 6X8.

The wire from *pin 3* is then removed from the old socket and connected to *pin 9* of the new socket. This is the plate wire from the first i.f. transformer. From this transformer a red lead is connected to a 2200 ohm resistor on a terminal board adjacent to the chassis. Remove this resistor and replace it with one whose value is 5100 ohm 1 watt (new). At the point where the new resistor is connected to the B supply bus (a red cabled lead) it is necessary to place a new 1 μf by-pass condenser, the other end of which should be connected to the ground lug of the adjacent terminal board. This is required to prevent the i.f. from oscillating with the increased gain of the 6X8.

After the wiring changes are completed, turn on the receiver. With a 20,000 ohm-per-volt voltmeter it is possible to check the currents drawn by the plate and screen of the mixer, and the plate of the oscillator. For all these measurements, set the receiver at 30 megacycles. The position of the other controls may be at any point since they do not affect the readings. The plate of the oscilla tor and the screen of the mixer should both indicate a reading of slightly under 105 volts, since they are connected to the VR-105 regulator tube through decoupling resistors. From the schematic it may be seen that most of the circuits are decoupled with a 2200 ohm resistor except the mixer plate which is now 5100 ohms. The voltage may be measured across these resistors in the mixer and oscillator; their respective currents may be calculated by Ohm's Law. The currents should be approximately as follows:

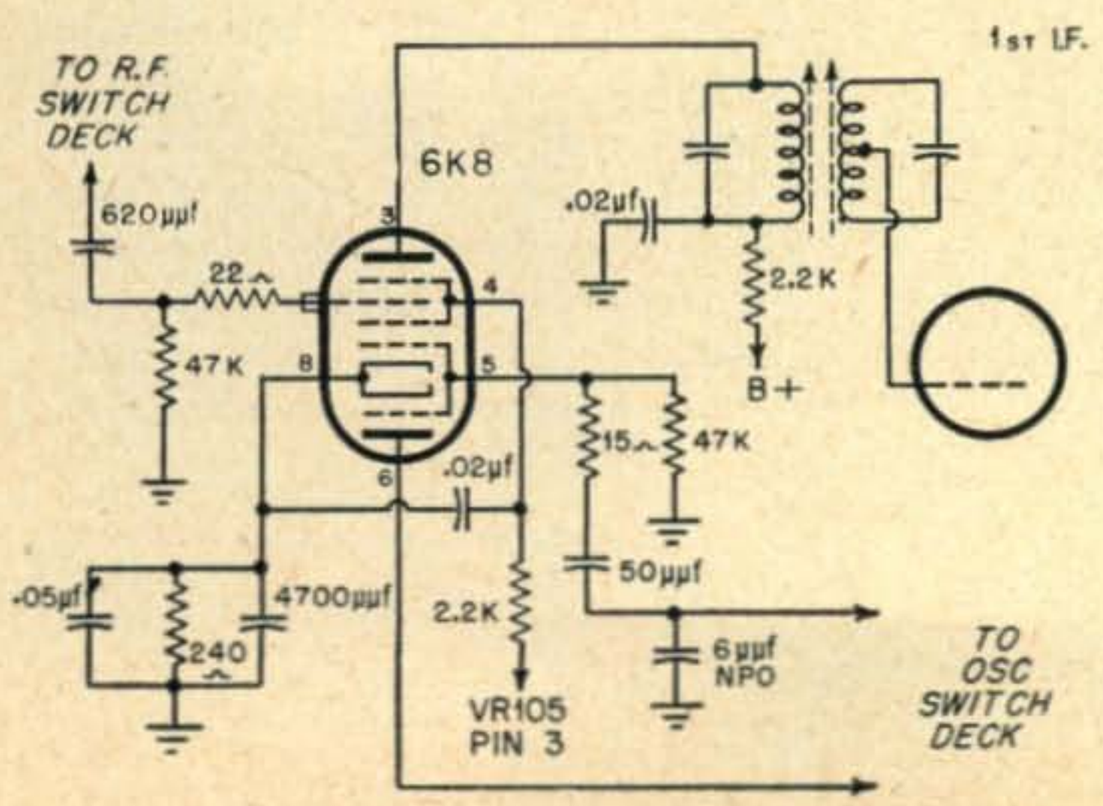
Mixer plate 4 ma., mixer screen 1 ma., oscillator plate 3 ma. If a VTVM is available the injection voltage at the mixer grid may be measured and it will be approximately 3 volts.

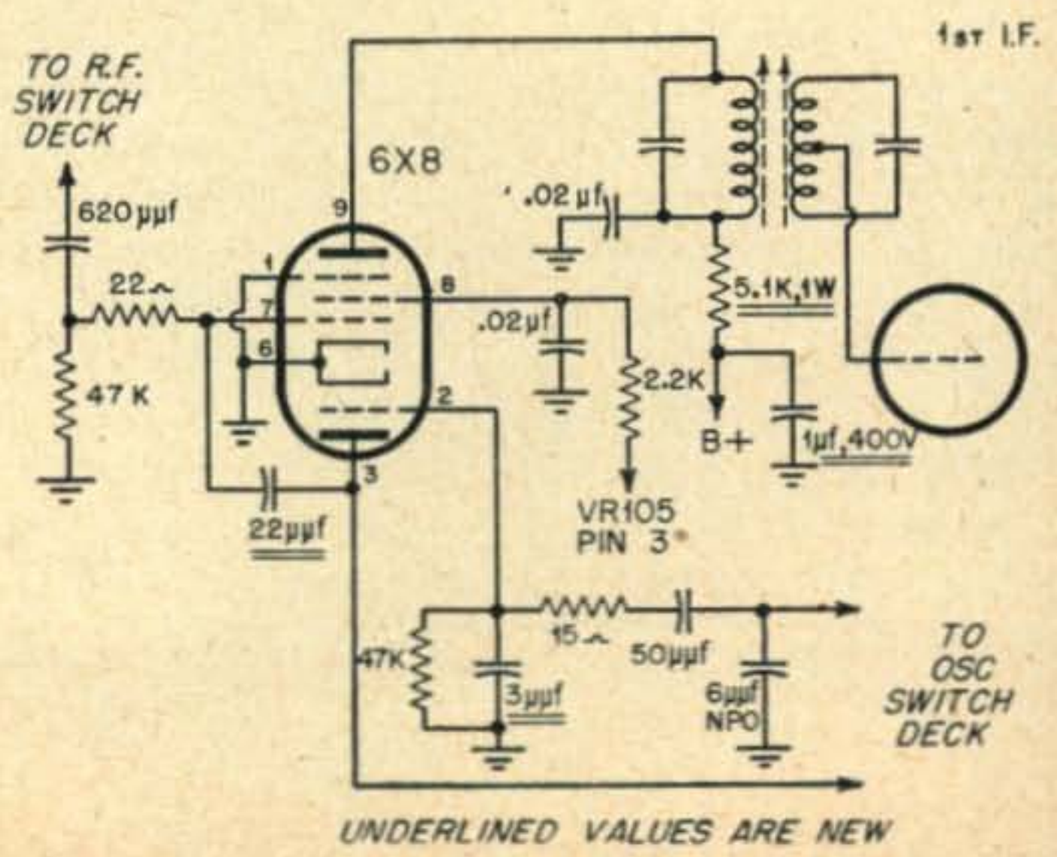
Tuning Up

At this point it is desirable to check the dial calibration as indicated in the instruction manual

(Continued on page 69)

The mixer circuit before and after modification.





CQ Tests The 6155 Tube

The recent announcement of the type 6155 power pentode—an improved version of the popular 4-125A—by the Amperex Electronic Corporation should be of interest to all users of this tube.

The original 4-125A satisfied a demand for an easy-to-drive r.f. amplifier capable of handling about 500 watts input (per tube) at frequencies up to 120 mc. The 4-125A also demonstrated its ability to perform on the v.h.f. bands, and today it is used by a majority of the amateur stations running over 500 watts input on the two-meter band.

Compromises are involved in using a tube designed primarily for use on the lower frequencies in the v.h.f. spectrum. Although it is possible to obtain satisfactory stable operation at two meters with a moderate amount of care in circuit layout, bypassing, shielding and neutralizing, most users of the 4-125A at 144-mc (at least, most of 'em that we've encountered!) are willing to admit that their finals are a bit "temperamental". Neutralization seems to hold over only a narrow range of frequencies. Unexplained circuit unbalances sometimes develop. Tubes are not consistent — some show higher efficiencies than their brethren for no apparent reason. The driving power required at 146 mc seems to be on the order of 30 to 50 watts as compared with around 10 watts on the lower bands. Thus any tube which offers operating characteristics similar to those of the 4-125A with the possibilities of improved v.h.f. performance deserves attention.

The Amperex 6155 is physically interchangeable with the 4-125A despite the marked differences in external appearances. The 6155 has no metal skirt around the base and no pin-support plate. The pins mount directly in the fused glass base seal. The rugged looking carbon plate contrasts with the shiny metal plate of the 4-125A.

On The Air Tests

Two sample Amperex 6155 tubes were tested in a push-pull amplifier which has been used extensively on two meters for over a year. This unit uses parallel-lines in both grid and plate circuits, with hair-pin links for drive and output coupling. The grid line is tuned by a sliding shorting bar, the plate by a small trimmer capacitor located near the hot end. Screen grid neutralization is employed, a 50 uuf (max.) variable capacitor being used from screen grid to ground on each tube. Screen current is fed to each tube through a two-meter r.f. choke. Combination grid-leak and fixed bias is used with a 5000 ohm grid leak common to both tubes. This amplifier is typical of many currently in use in ham stations.

No difficulties were encountered in installing the new tubes. However, it was found necessary to extend the length of the grid line somewhat to resonate the grids at 144 mc. The big surprise came when neutralization was attempted. It was necessary to run the neutralizing capacitors to almost full capacitance to achieve proper operation! Tuning of the plate circuit was almost the same as with the original tubes. Slightly less capacitance was required in the plate tuning capacitor.

Operating conditions were set as nearly as possible to levels normally employed using the 4-125As. It was found that all currents and voltages were very close to their customary readings, even the screen currents were within 10% of normal.

Every effort was made to arrive at an unbiased opinion on the relative efficiencies of the old and new tubes. The power level monitor showed nearly identical outputs at equal input levels—perhaps a few percent in favor of the 6155. Comparative tests made on the air with stations known to have stable and accurate "S" meters yielded similar results. Here it should be noted that the 4-125As used in these comparisons were a pair carefully selected from several on hand as being the best available. Possibly this influenced our results a' informal reports from other experimenters have indicated a more noticeable improvement.

Stability

The most worthwhile gain realized was the im-

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Ionospheric Propagation Conditions

GEORGE JACOBS, W2PAJ*

The vernal equinox period (that period when the sun's center passes the plane of the equator), extends into April. April therefore, is a month of changing radio propagation conditions. Ten meters will be almost completely dead for east-west paths, and its usefulness will decrease considerably for north-south paths. Twenty meters will be more reliable than it has been during the winter and the band will remain open longer for all circuits. Forty meters will taper off a bit as night-time absorption values increase, although this band will improve somewhat for long distance circuits to Oceania. Higher absorption and increased atmospheric noise levels should make eighty meters poorer for DX this month than it has been during the winter months.

With higher night-time usable frequencies expected during April, local 75 meter phone networks will not be disrupted by drop-outs that occurred as early as 7:00 p.m. during the winter. During April, the band should hold up for local nets until at least 11:30 p.m., local time, during normal propagation periods.

Propagation data for this month is based on a predicted smooth Zurich sunspot number of 52.

We have received quite a few letters asking why it appears that certain radio signals seems to arrive the "long way around," rather than the "short way." For the most part radio waves travel along the shortest path (or its reciprocal), between the transmitter and receiver. This path is called a great circle path. It appears as a straight line on great circle type charts. Whether the signal will travel the short direct path or long reciprocal path depends principally upon absorption. A radio signal is attenuated because of the distance it travels and because of absorbing qualities of the ionosphere itself. A signal traveling a dark path, that is one on which there is very little sunlight, will be far less attenuated by the ionosphere than one traveling a sun-lit path, providing the distances traveled on each path are approximately the same.

For the most part, radio paths received in the United States from Europe, Africa, South America, etc., arrive from the direct path. This is because the distance is so much shorter for the direct great circle path, that although daytime adbsorption may be high, the total absorption due to the distance facter and the ionosphere is less than the total absorption on the longer path. However, for paths that arrive from the other side of the world (referred to as antipodal paths), from Oceania Central Asia, etc., the situation is a little different. Here, the difference in distance between the long and short paths is not very much, and the signal will come around the path that has the most darkness upon it. During the equinox period (March, April, September, October), there exist the longest periods of darkness on antipodal paths, and during these months there is a strong tendency for these paths to arrive over the long as well as short routes. All times of band openings given in the **Propagation Tables** are based upon short paths. It is well to point out though, that during April, paths, for example, from Australia may arrive at east coast USA over the shorter Pacific path with the KH's etc., or along the long path over South Africa and arrive with the ZL's etc.

Indian and Central Asia signals may reach the Pacific coast USA over the shorter Asiatic path coming in from about the same direction as the JA's or around the longer path arriving with the Europeans. Usually this dual path reception takes place only on 20 meters. Ten meters is strictly a daylight path, and 40 and 80 meters are usually dark paths, where the signals arrive from the short great circle route. Twenty meters can support day-night transmission and it is here that these certain paths may come from one great circle direction or its reciprocal.

*3620 Bedford Ave., Brooklyn 10, N. Y

General Propagation Conditions for April

The following is a brief description of expected propagation conditions for amateur circuits from the United States to the five major areas of the world. For times of band openings for any particular circuit, refer to the **Propagation Tables**.

EUROPE

No **ten meter** activity is expected for an occasional opening from Southern W4 (Florida & also Cuba,) to North Africa & Southwestern Europe. Good conditions are expected on **twenty meters**. With increased hours of daylight, the band is expected to stay open until after 0000 GMT, with good circuits possible to all areas of the USA. Although night-time absorption values are increasing, **forty meters** should still produce some strong signals during dark hours. **Eighty meters** will be quite noisy. openings will be fewer and signals weaker than they were during the winter months.

SOUTH AMERICA

Good **ten meter** conditions are expected during daylight hours to all parts of Latin America. Ionization should be strong enough to permit **twenty meters** to remain useful throughout the dark hours as well as during the daylight hours. Because of the absence of solar absorption during the dark hours, signal intensities should be very strong. Good conditions are expected on **forty meters**, especially to Countries North of the Equator, fair conditions are expected on **eighty meters**.

AFRICA

These transmission paths have control points in higher ionized regions than do European circuits so that the MUF for these circuits are higher. Although little or no **ten meter** activity is expected to Europe, some ten meter openings are expected to occur to Central & South Africa from all areas of the USA. Openings will generally be erratic, with weak signal strength and considerably QSB. **Twenty meters** to Africa is expected to be quite good. Some **forty meter** openings are expected and possibly some infrequent **eighty meters** openings. Both bands are useful only when the path is completely in darkness.

OCEANIA: (Australia and New Zealand)

Some **ten meter** openings are expected to the Pacific Coast, with a few possible openings to the Central & Eastern sections of U.S.A. during days of better than normal propagation conditions. Fairly good conditions on **twenty** with two distinct openings, an early morning and an evening one. Fair to good conditions are expected on forty meters, with some good openings during propagationally stable periods. Some **eighty meter** activity expected, but signal levels very weak, and very often below the general noise level.

Last Minute Ionospheric Storm Predictions

Below normal radio conditions are expected April 2-6, 10-11, 17-21, 29-30. With certain types of ionospheric disturbances there is often noticed an increase in Sporadic E. Therefore, during ionospheric disturbances high frequency DX may be poor but there may be noticed an improvement in VHF DX.

(Continued on page 69)

April 1952

EAST COAST TO: (Centered on Washington, D. C.)	10 Meters	20 Meters	40 Meters	80 Meters
		ALL TIMES IN G M T		
Scandanavia	Nil	1000-1200 (2) 1200-2000 (1-2) 2000-0000 (3)	0000-0500 (2(	0100-0500 (1)
Great Britain & Western Europe	Nil	1000-1230 (3) 1230-2000 (2) 2000-0000 (3-4)	2200-0700 (3)	2300-0600 (2)
Balkans	Nil	1000-1130 (2) 1130-1930 (1-2) 1930-0000 (3)	0100-0400 (2)	0130-0330 (1-2)
Southern Europe & North Africa	1730-2100 (1)	1000-1300 (3-4) 1300-1900 (2-3) 1900-0100 (4)	2300-0600 (3-4)	2330-0530 (2-3)
South Africa	1600-1900 (1-2)	1000-1900 (1) 1900-1230 (3) 0600-1000 (1-2)	0000-0300 (2)	0100-0300 (1)
Near East	Nil	1000-1100 (1-2) 1100-1900 (1) 1900-0000 (3)	0000-0330 (2)	0100-0300 (1)
South America	1400-2300 (3-4)	1000-1300 (3) 1300-2100 (2) 2100-0700 (4) 0700-1000 (2)	2230-1000 (3)	2330-1000 (2)
Hawaii	2100-2300 (0-1)	1500-0200 (2) 0200-0600 (3-4)	0600-1330 (3)	0630-1300 (2-3)
Oceania	2200-0000 (0-1)	1200-1430 (2-3) 1430-0200 (1) 0200-0600 (2-3)	0500-1200 (2-3)	0700-1100 (1-2)
Guam	Nil	1230-1500 (2-3) 1500-0200 (1-2) 0200-0530 (2-3)	0800-1100 (1-2)	0900-1030 (0-1)
Japan	Nil	1200-1550 (2) 1900-0130 (1) 0130-0400 (2-3)	0700-1100 (2)	0730-1000 (1)
India	Nil	1100-1900 (1-2) 1900-0200 (2)	0100-0500 (1-2)	Nil
Philippine Islands & East Indies	Nil	1100-1700 (2) 1700-0000 (1-2) 0000-0400 (2-3)	0630-1100 (1-2)	0730-1000 (0-1)

CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	20 Meters	40 Meters	80 Meters
		ALL TIMES IN G M T		
Great Britain & Western Europe	Nil	1100-1300 (3) 1300-2030 (2) 2030-0030 (3-4)	2330-0700 (3)	0030-0600 (2)
Southern Europe & North Africa	Nil	1000-1300 (3) 1300-2030 (2) 2030-0100 (3-4)	2230-0630 (3)	2330-0600 (2-3)
South Africa	1600-1900 (1-2)	1000-1900 (1) 1900-0230 (3) 0600-1000 (2)	0000-0330 (2)	0100-0300 (1)
South America	1530-0000 (4-5)	1100-1400 (3) 1400-2200 (2) 2200-0900 (4-5) 0900-1100 (2-3)	2300-1100 (3-4)	0000-1000 (2-3)
Hawaii	2100-0100 (1)	1430-0100 (2) 0100-0730 (3-4)	0600-1400 (3-4)	0700-1300 (3)

April 1952

CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	20 Meters	40 Meters	80 Meters
	ALL TIMES IN G M T			
Oceania	2200-0200 (1-2)	1300-1700 (2-3) 1900-0230 (1-2) 0230-0700 (2-3)	0700-1300 (2-3)	0730-1230 (1-2)
Japan	Nil	1300-1700 (2) 1700-0200 (1) 0200-0730 (2-3)	0830-1330 (2)	0900-1300 (1)
Philippine Islands & East Indies	Nil	1300-1700 (2) 1700-0130 (1-2) 0130-0400 (2-3)	0800-1130 (1-2)	0830-1100 (0-1)
India	Nil	1300-1900 (1-2) 1900-0400 (2)	0100-0500 (1-2)	Nil
Central America & Northern South America	1700-2300 (3-4)	1100-1400 (3-4) 1400-2200 (3) 2200-0400 (4-5) 0400-0900 (3-4)	2300-1130 (4)	2330-1030 (3-4)

WEST COAST TO: (Centered on Sacramento, Calif.)	10 Meters	20 Meters	40 Meters	80 Meters
	ALL TIMES IN G M T			
Europe	Nil	1330-1900 (1-2) 1900-2330 (2-3) 2330-0100 (1-2)	0200-0700 (2)	0200-0700 (1-2)
South Africa	2200-0000 (1)	1300-2200 (1-2) 2200-0330 (3) 0330-0600 (1-2)	0200-0600 (1-2)	0230-0600 (1)
India	Nil	1430-1900 (2-3) 1900-0700 (1)	1100-1400 (1-2)	1200-1330 (0-1)
South America	1800-0200 (3-4)	1300-1430 (2-3) 1430-0000 (2) 0000-1000 (4) 1000-1300 (1-2)	0200-1130 (3-4)	0230-1130 (2)
Hawaii	2200-0200 (2)	1600-1800 (4-5) 1800-0200 (3) 0200-0600 (5)	0300-1300 (5) 1300-1600 (2-3)	0400-1500 (4-5)
Oceania	1930-0430 (3-4)	1700-0500 (1-2) 0500-1130 (3-4)	0430-1530 (3)	0530-1530 (2)
Japan	Nil	1900-2030 (2-3) 2030-0400 (1-2) 0400-0900 (3-4) 1600-1900 (1-2)	0700-1500 (2-3)	0830-1400 (1-2)
Philippine Islands & East Indies	2200-0430 (1-2)	1500-2000 (2-3) 2000-0700 (1) 0700-1000 (2-3) 1000-1500 (1)	1000-1400 (1-2)	1100-1300 (0-1)
Guam	2200-0200 (1-2)	1500-1800 (3-4) 1800-0600 (2) 0600-0900 (3-4) 0900-1130 (1-2)	0800-1300 (2)	0900-1200 (1)
Alaska	0200-0430 (1)	1700-0200 (2-3) 0200-0900 (3-4)	0500-1330 (3-4)	0500-1300 (2-3)
Marshall Islands	2100-0300 (3)	1700-1900 (2) 1900-0400 (1-2) 0400-1000 (3-4)	0700-1400 (2-3)	0800-1330 (1-2)

Symbols for Expected Percentage of Days of Month Path Open:

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

Conducted by HERB BRIER, W9EGQ*

Most Novices choose the 3,700 kc Novice band when they go on the air, and there are many good reasons for doing so. On the other hand, there are also good reasons for choosing either the 27 mc or 145 mc band for at least part of one's operating time. Before discussing them, an elementary picture of how radio waves are propagated will be helpful.

Any simple transmitting antenna radiates in all directions and at all angles, although not necessarily equally efficiently. Radio waves radiated parallel to the earth's surface are called *ground waves,* and those radiated at an angle from the surface are called *sky waves* or *space waves.* We will discuss the latter first.

As radio waves travel in straight lines, they would be lost if there was not something in outer space to deflect them back towards the earth. There are layers of free electrons floating around in the upper atmosphere, which are ionized by ultra-violet radiation from the sun and are capable of deflecting radio waves. There are three of these ionized layers, the *D region,* approximately thirty-five miles from the earth's surface, the *E region,* approximately sixty-five miles up, and the *F region,* 150 to 250 miles up, the latter sometimes subdividing into two layers, called the F^1 and the F^2 layers.

The D region has few reflecting qualities and disappears at night, but it is important, because it attenuates low-frequency signals passing through it. This is one of the reasons why 3,500—4,000 kc signals are weak and their range limited in the daytime.

Both the E and F layers are capable of reflecting the waves, the maximum frequency depending upon how strongly they are ionized and the angle at which the wave strikes them. Ionization, in turn, varies with the time of the day, season of the year, and the eleven year solar activity cycle. It is highest when 1). sun spot activity is highest, 2). slightly after midday, 3). in the early spring and fall of the year.

Under normal conditions, all signals up to about three megacycles radiated at any angle will be reflected back towards the earth at any time. As frequency is increased, however, only lower and lower angles of radiation will be reflected until finally a frequency is reached above which no reflections are possible. During the peak periods of solar activity, this critical frequency exceeds fifty megacycles, but during minimum periods, it seldom exceeds twenty-five megacycles. These are daylight peaks, which are cut at least in half at night.

Books have been written on just single phases of space-wave propagation. For our purpose, though, the important thing is that the 27 mc band is in the part of the spectrum where the eleven-year solar cycle determines its usefullness for space-wave communications. Unfortunately, we are in the trough of the cycle—the winter of 1952-1953 being predicted as the absolute bottom—therefore the band will be useful for such contacts only in the early spring and fall for the next few years.

Luckily, the band will not be useless at other times. Besides the regular ionization mentioned above, there is another form, called *Sporadic E* ionization, of which very little is known, except

WN5TOM, Louis E. Frenzel, Jr., Galveston, Texas. The transmitter is a 6AG7 with 11 watts input. Receiver is an S-76, with an S-20R for a monitor. Long wire antenna. Louis is thirteen and in eighth grade. He has worked 26 states.

*385 Johnson St., Gary, Ind.

• 30 •

that it occurs unpredictably at any time of the day or night, more frequently from early spring to late fall than in the winter months. It is so intense that 27-mc "short-skip" contacts up to a thousand miles or more are possible for hours at a time on many days and evenings during the summer season.

Ground-Wave Communications

When space-wave communication is impossible, there is always the opportunity for ground-wave contacts, over distances easily calculated from the general formula:

$$D = 1.41 \left(\sqrt{H_t} + \sqrt{H_r} \right)$$ where

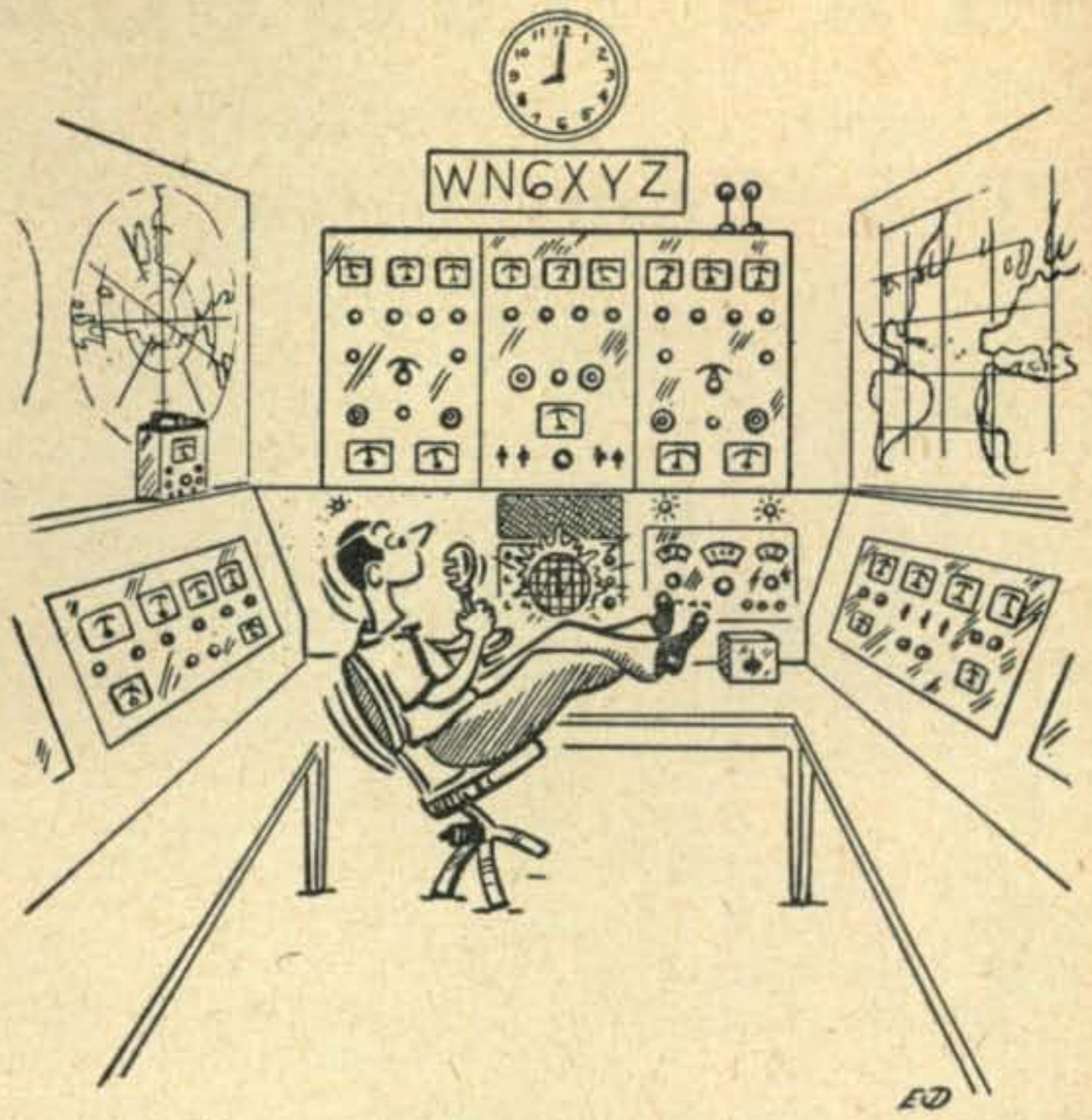
Ht and Hr are the heights, in feet, of the transmitting and receiving antennas, respectively, and D is the distance between them in miles. As an example, antenna heights of twenty-five feet work out to a distance of fourteen miles, which is not the maximum possible distance that can be covered but rather the maximum distance that one can expect to cover every day of the year, assuming normal terrain, though range may often be much greater. The strength of signals over the path will depend on the power radiated and the ground losses, which are least over sea water and salt marsh and maximum over dry, sandy, rocky soil. Obstructions in the path may reduce the range, although they sometimes do just the opposite.

Changing atmospheric conditions may also increase ground-wave range. Ground-wave radiation is the normal form of propagation on the 145-147 mc band, but variations in weather conditions affect it in ways that appear similar in their effects to the action of the ionosphere on sky-wave, signals, although the distances covered are less. One of the ways in which meterological conditions can increase 145 mc range is by temperature inversions. Normally, both air temperature and its moisture content decrease with increasing height above the earth. Should a layer of cold air roll under a warm one or a layer of warm air under a cold one and upset normal relationships, a v.h.f. signal travelling through these layers of different densities is refracted, much like a beam of light shining into a pool of clear water or through a piece of glass, thereby increasing normal ground wave range many fold.

While unpredictable in the manner that W2PAJ predicts high-frequency DX paths each month in *CQ*, temperature inversions occur so regularly in some parts of the country, either the year around or at certain seasons of the year, that the resulting increased range becomes almost as regular as the sun rising each morning. They are especially frequent along coasts where a prevailing off-shore breeze reverses to an in-shore breeze at sundown. Bill McNatt's UHF/VHF column is full of references to extended ground-wave contacts on 145 mc, made possible by quirks in local atmospheric conditions, and it is almost unbelievable how strong the signals occasionally become.

Choosing the Band

It might seem strange to suggest a frequency as erratic as 27 mc during the present phase of the



"Just got my Novice license here, OM — !!!"
(Tnxs to OA4ED)

solar cycle or the limited range of 145 mc, when the 3,700 kc band, with its well-known advantages, is available. Actually it is not; interference is the great equalizer. Many Novices, using low power and a makeshift antenna, who find it difficult to work anyone on 3,700 kcs in the evening, could make many successful contacts on one of the other bands. A certain amount of judgment must be used in deciding to operate on a band with a restricted range. Someone living miles away from the nearest neighboring ham would be ill-advised to limit himself to the 144 mc band. For that matter, limiting oneself unnecessarily to one band reduces chances of getting the full enjoyment from one's hobby.

Naturally, Novices who are primarily interested in phone operation are limited to the 145 mc band. Others who might find this band particularly suited to their needs are scout troups, schools, and similar groups, many of whose members have or are working for their Novice licenses, and who find it difficult to work each other on 3,700 kc because of the interference.

Another advantage of the higher frequencies is the smallness of the antenna required, compared with 3700 kc ones. One for 27 mc need be only seventeen feet long and for 145 mc, only forty inches; therefore almost everyone has room for a simple directive array, which will increase effective power several times. A subsequent *Novice Shack* will discuss antennas, including some simple beams.

Equipment

Since our roundup of Novice transmitters, information on two more built by *Lysco* has been obtained. The first is the Model 650, a three-stage, 40-watt c.w. transmitter for the amateur bands between 3.5 and 30 mc. It has a total of five tubes, and costs about $110.00, with built-in antenna tuner and power supply, and coils for one band. A crystal, key, and antenna complete the installation.

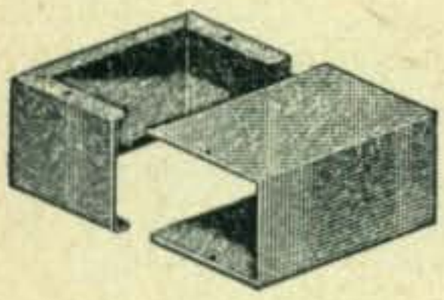
(Continued on page 56)

The Newcomer's Buyway

"The Competitor"

Operating your own two-way station is now quite simple. With equipment smaller in size than most TV receivers you will be able to talk to fellow hobbyists across town, in other states, and occasionally, when conditions are good, thousands of miles away. If you always thought it took all kinds of high-priced special equipment to do this, stand corrected. Take, for example, the microphone you will use with your transmitter, the "sending" part of your station. An ideal mike, low in cost but high in audio quality, equally suited for hand, desk or stand use, is the Turner Company Model 60X, a moisture-sealed crystal mike popularly known as "The Competitor". This mike has — Response: 70 to 7,000 c.p.s.; Level: 52 db below 1 volt/dyne/sq. cm. The model 60X has a list price of $10.85 while model S60X, which has an "on-off" slide switch, lists at $12.85. For more information see your Distributor or write The Turner Co., 929 17th St. N.E., Cedar Rapids, Iowa.

The Box of 1000 Uses



There are thousands of uses in the fields of radio and electronics for these new boxes. They are made from heavy gauge aluminum. The design of the box permits installation of more components than would be possible in the conventionally designed box of the same size. It is of two piece construction, each half forming three sides. The flange type construction assures adequte shielding. Available in etched aluminum finish and gray hammerloid finish.

Catalog Numbers Grey	Etched	Length	Width	Height
CU-2100	CU-3000	2¾"	2⅛"	1⅝"
CU-2101	CU-3001	3¼"	2⅛"	1⅝"
CU-2102	CU-3002	4"	2⅛"	1⅝"
CU-2103	CU-3003	4"	2¼"	2¼"
CU-2104	CU-3004	5"	2¼"	2¼"
CU-2105	CU-3005	5"	4"	3"
CU-2106	CU-3006	5¼"	3"	2⅛"
CU-2107	CU-3007	6"	5"	4"
CU-2108	CU-3008	7"	5"	3"
CU-2109	CU-3009	8"	6"	3½"
CU-2110	CU-3010	10"	6"	3½"
CU-2111	CU-3011	12"	7"	4"
CU-2112	CU-3012	17"	5"	4"
CU-2113	CU-3013	10"	2"	1⅝"
CU-2114	CU-3014	12"	2½"	2¼"
CU-2115	CU-3015	4"	2"	2¾"
CU-2116	CU-3016	4¼"	2¼"	1½"

See them at your Bud Distributor.

BUD RADIO, INC.

2118 EAST 55th ST. CLEVELAND 3, OHIO

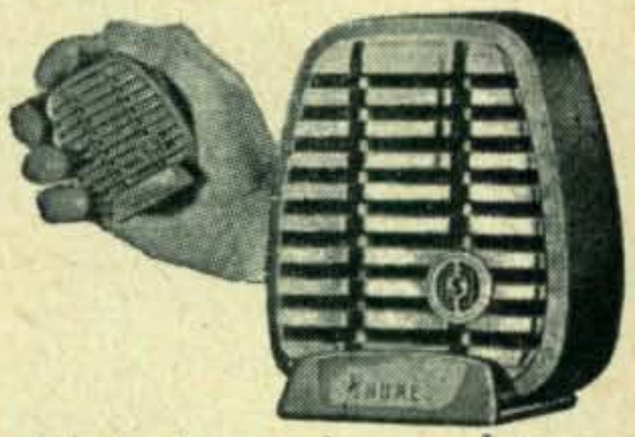
"Private Tutor"

ELDICO has long ago established its policy for the Hams . . . more active Hams . . . for the good of amateur radio . . . now and in the future. In keeping with this policy ELDICO designed a line of amateur equipment, in kit form, equal to or better than existing high cost equipment, and made these economical kits available to all by keeping the price down and quality up.

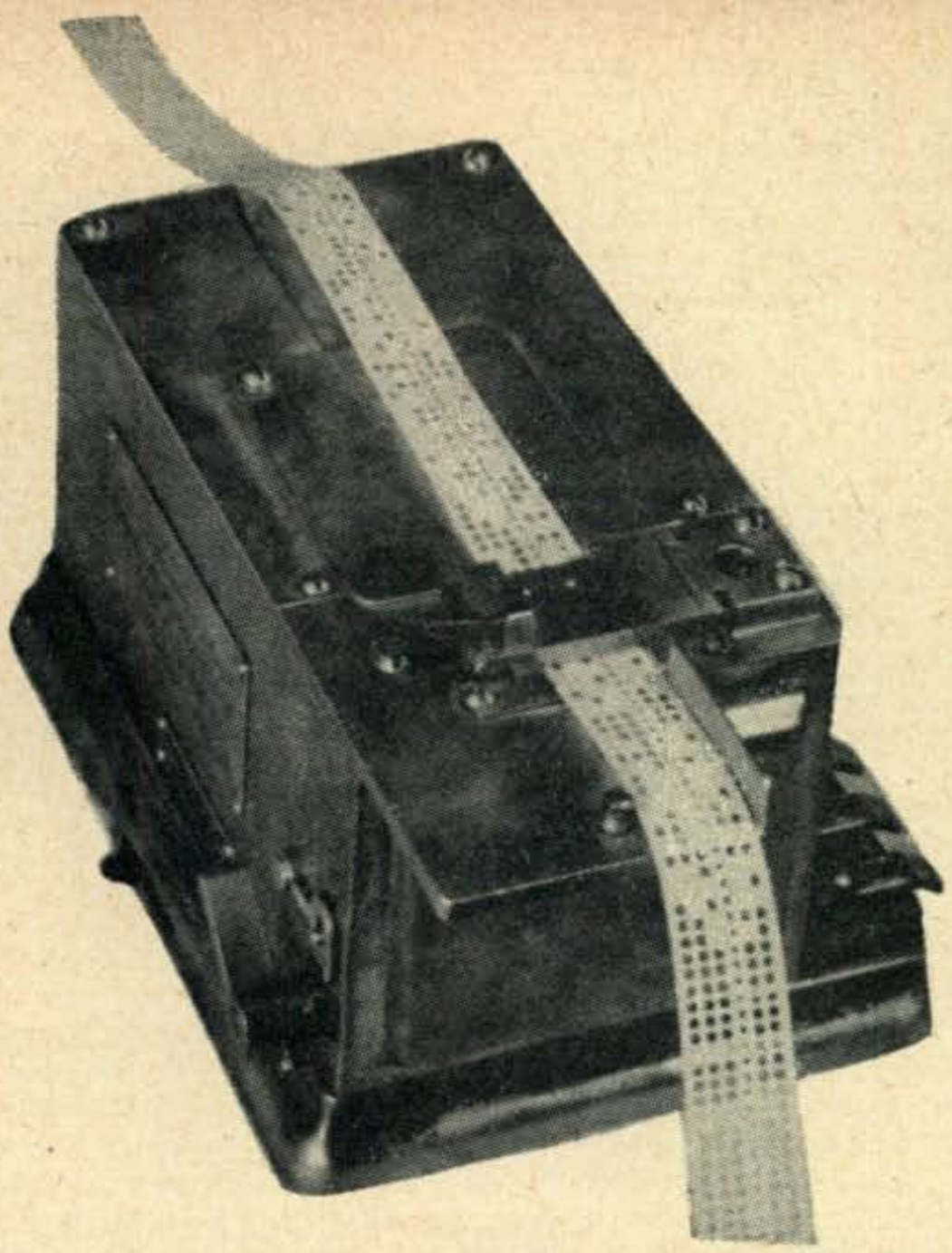
The Private Tutor Course was designed to further advance interest in amateur radio. The FCC provided the opportunity and ELDICO provided the means to become a Novice. An ELDICO Private Tutor Course with code on long playing Columbia records and theory in Braille was presented to the famous Bob Gunderson, W2JIO for use at the New York Institute for the education of the Blind. This has been so successful that the ELDICO program is being extended so that any blind person desiring to become an amateur, can do so without cost.

The Private Tutor Course is on sale at all ELDICO distributors. Five long playing Columbia records (33-1/3) for code training (a full five hours of playing time) six complete lessons covering Novice theory with examination for each. See the Private Tutor Novice Course at your dealers now. Complete course, code and theory $25.00, records only (code course) $17.00, theory course only $10.00

"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.



← Western Union Type 1A Tape Transmitter

TELETYPE

A Bi-Monthly Department
Conducted by WAYNE GREEN, W2NSD
1379 East 15th Street, Brooklyn 30, N. Y.

Says WØBP: " . . . equipment and technique have vastly changed in the past dozen years, with the requirement for not just dot-dash operators but trained electronic technicians (for the armed services). I am sorry to note that amateur radio has not kept pace with this. An outstanding example is frequency shift keying. Its advantages in greatly reducing the effects of noise, fading, and static in reception have been widely known for several years, yet nowhere in the present amateur regulations is type F-1 emission permitted on any frequencies capable of reliable communication over respectable distances. Similarly, amateur radio teletype operation is limited at present to on-off keying, yet I know of *no* commercial or government radio circuits that use this. If a person tunes across the short waves (except the amateur and voice bands) he will hear a huge number of frequency shift teletype stations. This should be ample testimony of the effectiveness of this means of communication; a field of self-training in which amateurs in this country are denied by FCC regulations."

Fuddy Duddies

Time was when the amateurs were the spearhead of radio and the commercials were a year or so behind them. Now take a look at us. Commercial radio has swooshed past us and, with the help of a few million dollars for research, has gone into television, radar, facsimile, etc. Communication companies have for several years been using, almost universally, techniques such as single sideband, frequency shift keying, etc., which are just now being explored by the amateurs. Why this strange lag in the use of techniques which have been proven by commercial stations? The present day attempt of a small group of amateurs to get the FCC to allocate some frequencies for frequency shift keying is meeting with resistance from amateurs who admittedly know very little or nothing about FSK. The major problem then is one of communication, of getting all of the information possible to those that might be interested. This presents a problem to the magazine publisher in the field for there is just so much space in each issue and it is difficult to devote this time and space to articles on things that can't even be used by the amateur because of the FCC restrictions.

There are some amateurs that will, if given a reasonable chance, try to keep up with the practices of the commercial stations. The recent activity in single sideband has well illustrated this.

ARTT 5004

Here is the diagram of the vacuum tube keyer that connects to P1 on the model 12 teletype machine in the February TT column. This device should eliminate most of the clicks that normally create havoc on the lower frequencies. The circuit was designed by Bob Weitbrecht, W6NRM, who has been using it with success for a couple years. Here is Bob's description of the circuit:

"As is well known, the model 12 printer uses six electromagnets requiring 300 milliampere pulses for proper energization. These pulses are generated and distributed by the receiving distributor. Then there is a seventh magnet, called "start", which is used for unlatching the distributor cam. All these magnets are operated through the distributor contacts and the polar relay contacts (unless the polar relay is not used) and the fact that they require approximately 300 milliampere currents poses a problem in noise-reduction. These contacts are a very prolific source of clicks and hash, not to mention causing BCI and other miscellaneous noises.

"There is one obvious way to quiet the contact noise—the use of techniques similar to those used in eliminating key-clicks in radiotelegraph circuits, plus adequate shielding of all the pulse lines to the magnets and elsewhere. Some fellows have had luck with such RF choking systems. Then there is another way—if the current through the contacts could somehow be reduced, and yet operate the magnets, there would be a corresponding degree of noise reduction. This is the method employed in solving the distributor noise problem at W6NRM, and is now being described.

"The circuit presented herein uses high-current power tubes in cathode-follower circuits, the coils of all the seven magnets being the loads of these tubes. Suitable tubes for this application are the 25L6, 50L6, and 6W6GT types. The latter type, 6W6GT, is a recently released six volt version of the 50L6 type, and is to be highly recommended from the standpoint of filament reliability compared with the high voltage heater tubes. Each 6W6-GT filament requires 1.2 amperes, so in order to run seven 6W6GT's a six volt ten ampere filament transformer is needed.

"The power needed to operate these cathode-followers is developed by a small BC-type power transformer, a 5V4, and a 40 mfd electrolytic filter condenser. The transformer need be of about 60 to 75 milliampere size, delivering not more than 300 volts each side of centertap: the reason for the latter limitation being in order to keep the peak voltage on the 40 mfd electrolytic within rating. As the transformer is called upon to deliver high currents for only about 25% of the total time ("duty cycle") the

60-75 ma. size is plenty sufficient and will not overheat even in long periods of operation.

"A bias supply, fed by the same transformer, is used to place cut-off bias on all the grids of the cathode-followers. Whenever a particular magnet is to be energized, the distributor contact for that magnet is closed in the normal turn-of-events, and a 20-30 volt positive voltage is transmitted directly onto that cathode-follower's grid. The cathode voltage will be elevated to about 40 volts with respect to ground and 300 milliamperes of current will flow through the magnet coil, thus energizing it. True, there is an apparent overload on the tube, but, considering duty cycle, the tube is called on to deliver this current only six milliseconds out of every 167 milliseconds or so, resulting in an average current of about 10 ma. per tube. Here at W6NRM there has never been any noticeable trouble in life of vacuum tube keyer tubes thus operated, aside from two cases of filamentary opens in the 50L6's previously used.

"The distributor pulses are fed into the cathode-followers through R-C pulse softening networks. As it works out, the current through the distributor contacts is only a matter of microamperes, rather than 0.3 ampere. There is in effect a definite improvement in noise reduction, and it is now possible to tune in a one-microvolt radio signal and print it without any trouble from contact noise, even with the receiver close to the printer.

"Hints on the use of the circuit: 1) Shielded wire is used liberally in wiring up all the outside cable connections, contacts, magnets, etc. 2) Be sure to allow the vacuum tube keyer tubes to warm up well before commencing operation of the printer in the interest of aiding the cathodes of these tubes, which are called upon to deliver such large current pulses. 3) Ground the printer table to a good water pipe ground."

W9DDG writes, "Vacuum tube keyer not a cure-all, but does help like the dickens. Very necessary to see that sufficient voltage is used on the keyer tubes in order to secure satisfactory operation."

It is my thought that 6Y6's (if you have them on hand as I do) would also work very nicely for keyers. When I build my keyer (very near future) I shall use 6AS7's (twin triodes) for the keyer tubes. These tubes are expensive if you don't already have them on hand, but look as if they would do a fine job of keying. According to my rough calculations they would only need about 100 volts on the plate in order to develop 300 ma. through the magnets, and that with zero bias on the grid! This would greatly simplify the power supply, reducing it to a simple selenium rectifier affair.

I might hastily point out that this elaborate keyer is necessary only for the model 12 machine. The newer models such as the 14, 15, etc., have only one selector magnet in them and thus require only one tube for keying purposes. The noise radiation from these newer models is usually low and the VT keyer may not be needed at all.

ARTT 5003

Here is the interconnection for the tape equipment. The placement of the various parts may be seen in the photographs. The power supply used in this particular unit uses a selenium rectifier and, since one side of the line is negative, the power supply is not grounded. The use of an isolation transformer is recommended, but due to the expense of such an item it was left out. The 110 volt d.c. output of the power supply is connected to a plug on the chassis so that the perforator can be plugged in to it. Actually, only one 450 ma. rectifier is needed for the distributor motor draws less than 300 ma. and the latch magnet and the transmitter advance magnet currents don't raise the total over 450 ma.

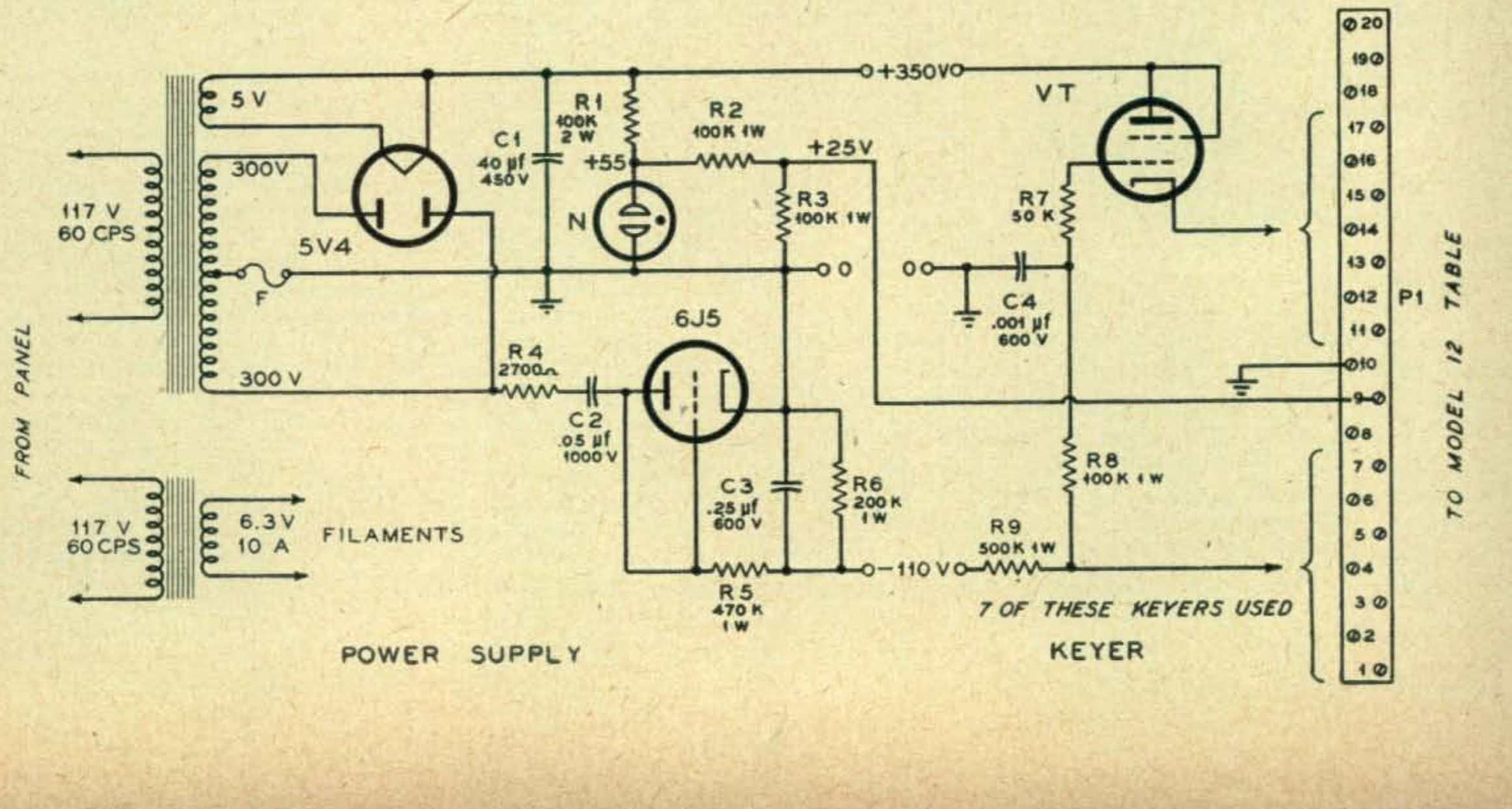
The tape transmitter jack-base is bolted to the panel by means of four drilled and tapped holes in the corner posts. This forms a nice rigid support. The distributor jack-base and tracks are mounted on the chassis. Thus both the distributor and the tape transmitter can be removed for substitution, repair, or lightening of the panel when moving it out of the relay rack. When mounting the WE 215A polar relay jack-base it is necessary to submount it a bit with some washers so that the relay will plug in firmly.

If the distributor is to be used with a reperforator or a model 21 printer then it is necessary to connect the segments of the other distributor section, the receiving distributor, to an eleven prong socket. If a second tape transmitter is to be used a switch can be built in to change the seven wires from the transmitter on the rack to the external one. A nine prong socket is built in the pictured tape equipment for this contingency; the switch is not. If the receiving distributor is not used the spring can be unhooked from the latch magnet so that the brushes will rotate whenever the motor is running; this reduces the load upon the motor.

The brushes of each distributor are made of short pieces of shielding braid which are drawn tight with a pair of pliers, bent into the slight arc necessary, and bolted to the rotating arms. The ends should be even and brush along the copper segments with a minimum of sparking. The governor should be set for 368 operations per minute (65 words per minute), the standard to which all amateur printers are adjusted.

The tape transmitter has two controls on it, one, S4, disconnects the tape advance magnet so that the transmitter will continue to send whatever character the pins are "feeling." This switch is at the bottom of the trans-

ARTT 5004 vacuum tube keyer. The wires from the grid circuits of the seven keyers that connect to terminals 1 to 7 on P1 (and from there to the table) should be shielded wires and well grounded. The connections from the cathodes to terminals 11 to 17, likewise. Terminals 8, 18, 19, and 20 are spares for future modifications.



mitter and is marked "on-off." The second control is the lever at the end of the transmitter marked "start-stop" which mechanically keeps the tape advance magnet from advancing the tape, and also keeps the five pins from feeling the tape. When this lever is in the "stop" position the transmitter sends blanks (this rings the bell on most printers, and the tape does not advance through the tape head. The metal plate under which the tape can be seen to pass is hinged so that the tape can be inserted or removed without trying to feed in an end in the small slot. Adjustments of the tape transmitter are touchy and should be avoided if possible. This subject will be left for future comment as it is a book in itself.

The tape transmitter, distributor, and keyboard perforator are quite inexpensive and are all available through the VHF Teletype Society which has contracts with most of the users of teletype equipment for the salvage of equipment which has been replaced by newer equipment.

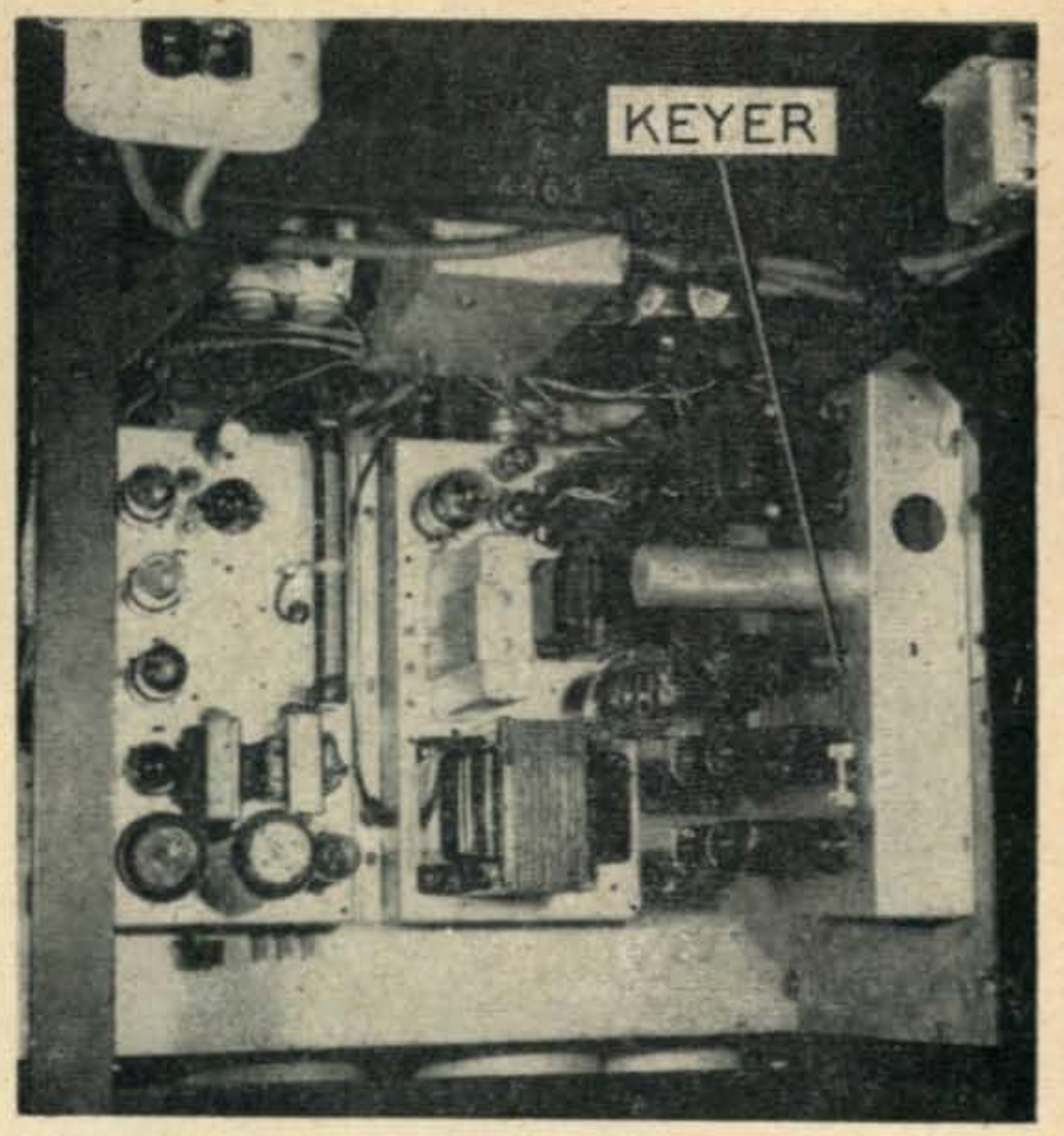
Radio Moscow

Quite a bit of the mail this last month was taken up with the question of how long is it going to be before the teletype gang can get in there on forty meters and start QRMing radio Moscow, which seems to have the high end of forty all its own way. First, let me quote from a letter from a Washington attorney, "If the proposal (Docket 10073) . . . turns out to be non-controversial, it is possible that the Commission will act by late winter or early spring. If, on the other hand, the matter turns out to be quite controversial, there is no telling when the Commission will take final action. Some rule-making proceedings have taken two years or even more; some have been completed in a few months."

Back in December I sent in a petition to the FCC asking for a 90 day test period for the teletype operators. The impression I got from my various contacts was that the 90 day test would be granted if it appeared that there was any serious delay in the legislation. Since the test has not been authorized it would seen that there is a good likelihood that the FCC is readying something a bit more permanent.

WANTED: A Con Man

Everybody that has written in so far is too agreeable, not even one temper ruffled by my caustic treatment of the ARRL in the last column. All of the letters have been "pro" and none "con." I would like to see this column improve with every issue, but how can I do this without your help? Surely there must be one improver in the crowd.



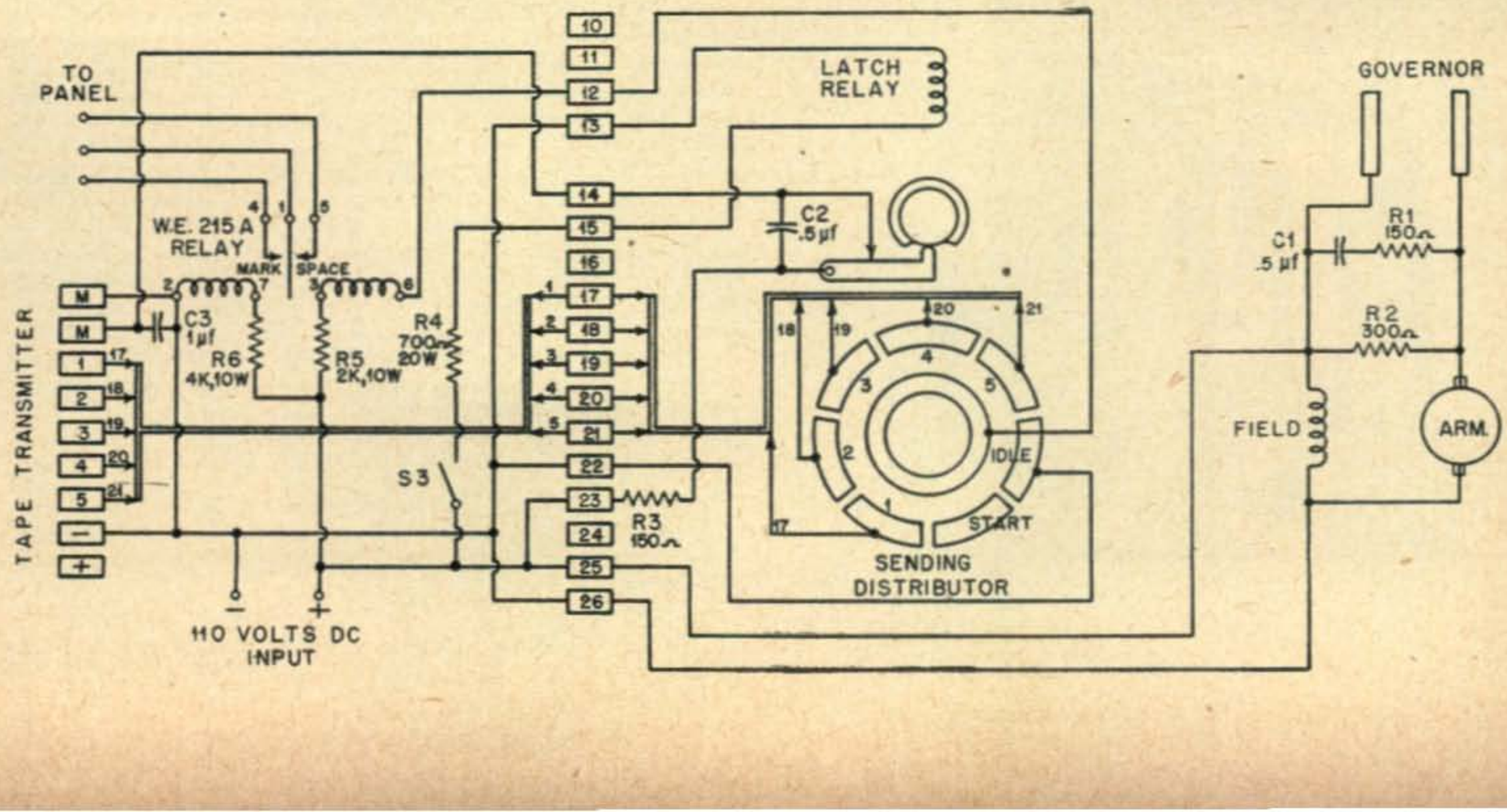
Vacuum tube keyer at W6NRM/9

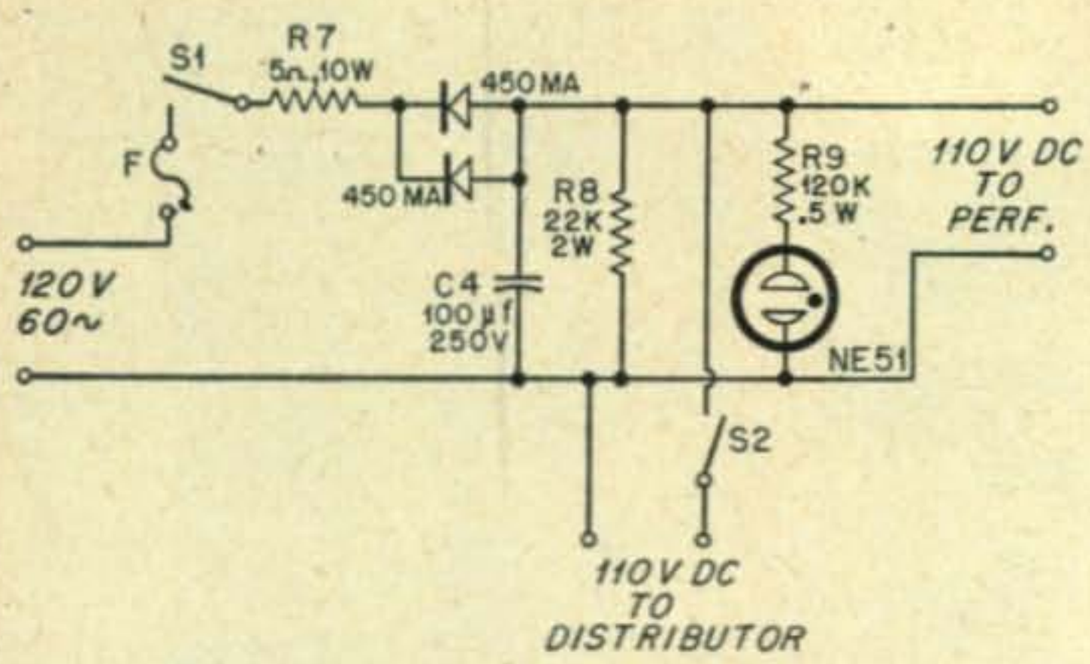
The format being followed calls for some discussion of current teletype news, typical comments and news from teletype stations, technical information on at least one aspect of teletype, and, if room, a listing of some of the active teletype gang. The first column (December) covered most of the basic material such as the teletype "code," types of keying, and the equipment necessary to get on the air. The next issue (February) explained tape operation and went into the actual wiring of the printer in detail. This column will go into the particulars of the vacuum tube keyer, more information on tape equipment, and give you a couple pictures of the gear involved. The June issue will have most of the available data on frequency shift keying circuits, and pictures of various polar relays in use. In July I hope to have a complete article describing the teletype panel, as designed and built by W2BFD.

Roll The Old Ball OM

A pet peeve of many ops, phone and CW, is the hello-goodbye QSO. I have found the answer to this vex in

ARTT 5003 tape distributor



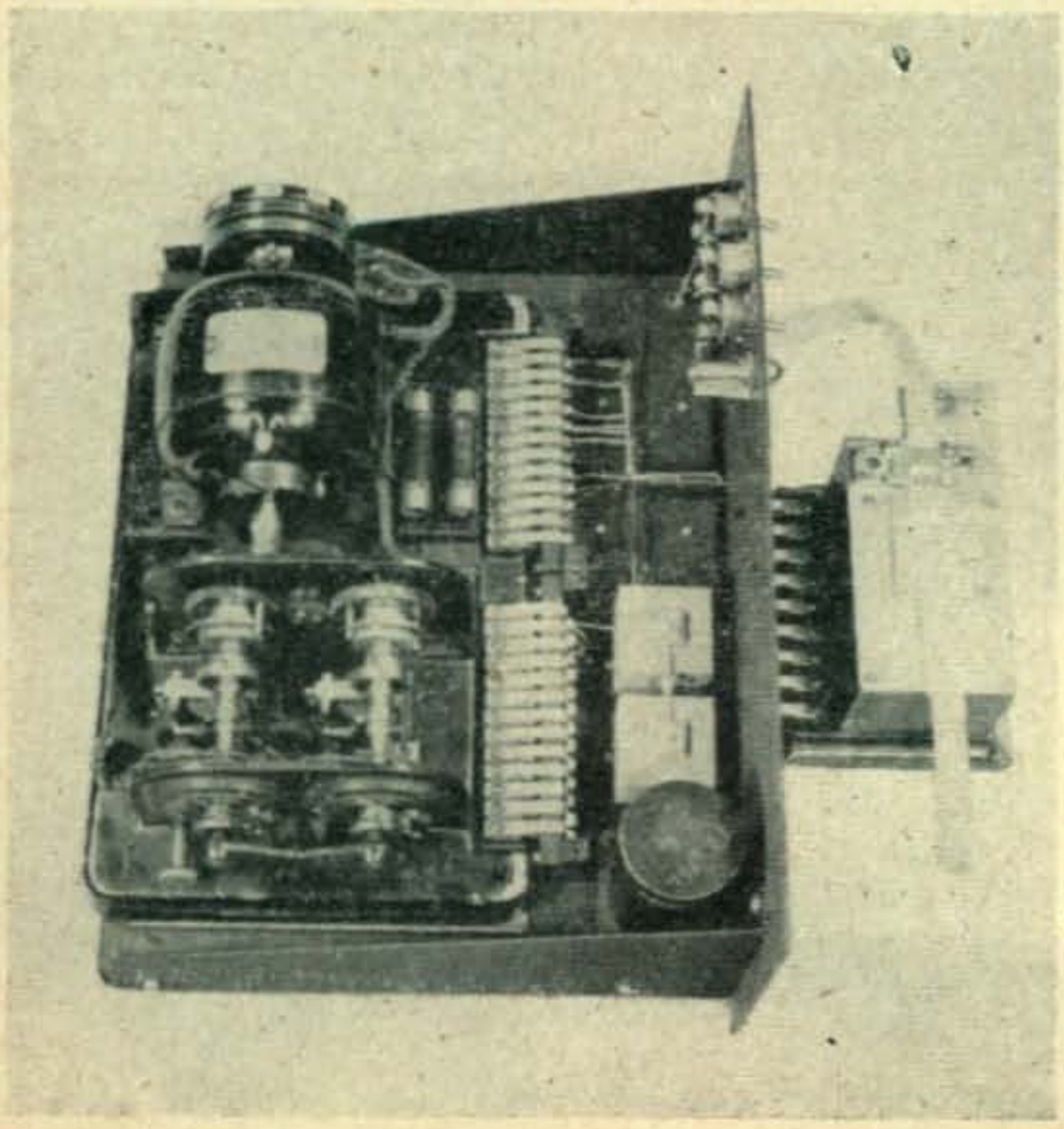


Power supply for tape equipment

teletype, and so have some others apparently. Writes WØTKX: "Teletype has something in common with SSB communications. The SSB boys are trying to do something to overcome the 17 db service differential between phone and CW without learning to use the code (most of them are good CW operators too, however) and they have made great progress in this direction. Teletype has not only overcome this 17 db, but has possibilities of even greater advantages than CW as far as 'tough path' communications are concerned. Teletype also has lots in common with CW: The spelling and expressions used to give an operator personality in RTTY are the same ones used on CW. The type of QSO is exactly like CW QSO's (I don't mean the hello-goodbye type, but the type engaged in by the more advanced operators). Most important of all, teletype requires that the operator be able to express himself with lucidity. A ham who is doing something and is able to talk about it never lacks for an interesting subject for a QSO. SSB enthusiasts and RTTY men are, in my estimation, among the most interesting conversationalists in the racket."

NOW SEE HERE, what is all this noise about not being able to get filters? This is sheer nonsense right from the ground floor up; why should you have to "get" filters? The design and construction of these units was described in detail in the November 1946 CQ. Shucks, just a few years ago there was hardly a ham in the country that hadn't wound some of his own transformers. How many of you have done that? You ought to try it some time for there is a great feeling of accomplishment when you get one made and find that it works fine. This applies to teletype too, for many of the gang have been afraid to try to make their own filter transformers. The construction of these units is really quite simple and doesn't even require any winding. A couple of years ago I made a set and they worked fine, why can't you do the same?

Complete tape unit at W2NSD



Mail Bag Quotes

W2ANB: "I am not active on RTTY as yet but hope to be very soon; my wife, W2ZPR, also is interested. We are building the receiving unit (panel) and a copy of the (Collins) 709D-1 to work into either a model 12 or a model 21 printer. We also have the tape perforator, distributor, and transmitter."

W6NRM/9: "Gosh, this place (Yerkes Observatory) sure has some treasures hidden away in the attic. Ran across some Bell Tech. Journals and Franklin Institute Journals and they had articles on printing telegraphy and even radio circuits for printing telegraphy. The earliest application of radioteletype seems to have been 1919, shortly after the invention of the audion tube. This system was strictly make-break and they commented on the reliability of this system in comparison to signaling over wire lines. Rather interesting reading, though brief and non-technical."

W2BOI: "Answering your questions: (A #14 printer is a single-magnet typebar tape printer (prints on a strip of paper rather than a page) used by Western Union and brokerage houses. Western Union calls it a 2-B Simplex. A #24 is a single-magnet typewheel page printer (the type is in a circular drum similar to a children's play typewriter rather than in a basket as in a regular typewriter) in which the typewheel rotates about a fixed axis while the paper carriage moves from side to side as in the #12. A #26 is an improvement on the #24 in which a longer and more powerful striking arm is used to press the type pallet against the paper. All teletype printers later than the #12 are single-magnet printers which may be operated directly off a 60 ma. line without requiring a line relay or local battery in the set. See Bell System Technical Journal, Oct. 1938, pp. 620-639, for descriptions and illustrations of the more popular Teletype models."

W9TQ: "W9DDG and myself had our first RTTY sked on Jan. 29th, not much good however—both bothered by noise. On Feb. 4th Gene and I had our best contact. I copied him solid and he got my first transmission OK, after that he had antenna trouble which he fixed with a folded doublet pronto."

W2NSD: (me) When enough of the teletype gang return the questionnaires I sent them over three months ago I will present a list of who's who and what he is using. W3PYF visited here the other day while on a business trip to the City. W7LUK visited John and called on the phone to say hello. W1JVE says that Handy (W1BDI-ARRL) is trying to sell out his TT gear.

W1QSX: "At the present time I have a model 12 printer set up. Have copied commercials and the signal from W2NSD on 80 a couple times."

W6NRM: "You might remember the QSL I sent you regarding reception of 11 meter AFSK RTTY signals from W2NSD. That was the very first day of the year of 1950. That was a day well worth remembering because after days of fruitlessly searching the 11 meter band for ham RTTY signals, I tuned in your signals and got something that seemed to print sense on the printer, hi!"

W6ITH: "After I established the first Trans-Pacific Amateur RTTY contact from W6ITH-JA3RO and the first mainland to Hawaii to KH6LP in 1950, I more or less lost interest since there were just no hams to work on the bands. Worked schedules many times with Art Collins, of Collins Radio Company, (WØCXX) and with many other stations using both true FSK and AFSK. I have worked 41 different stations on RTTY So far."

As a closing topic I would like to quote a couple of figures from an article by J.J. Coupling in ASF: Mar. 1952.: Table IV: Power for Earth-Mars link, 3 cm wave length, 50 foot antennas.

Type of communication	Power in watts, Mars at closest	Power in watts, Mars at furthest
teletype	.24	4.0
telephone	570.	9,300.
television	570,000.	9,300,000.

Calling CQ Mars RTTY, no, not M.A.R.S.; I said: Mars. ..... de W2NSD .....

from R. V. SPENCELEY, KV4AA*

Our congratulations go to our only new WAZ of this month:

No. 278 **PY2CK** Jayme Campos Freixo 40-224

Sorry fellows no HONOR ROLL this month due to lack of space.

A letter from Russ King, W9OUH, a recent graduate from the Novice ranks, sporting a modest 35 watts, reads, in part, as follows: "DX seems out of my world for the most part. By this, I mean, how does one go about getting 'in' on this DX deal? Is more power needed or is DX only for the fast "ops", etc. How about a short paragraph on the subject for newcomers like myself?"

Well . . . Russ, that's a tall order for a short paragraph as the angles on this would probably fill a good sized book. However, we will do our brief best in hopes that it may shed some light on "DXitis" from our point of view. Firstly, your viewpoint has probably been shared by all the present DX wizards at their own starting points. Only with increasing experience, power increases and antenna improvement have their present high DX totals been achieved.

Secondly, and somewhat brutally, we list the following attributes as probably the best DX set-up. These are in order of their importance:

PATIENCE
OPERATING KNOW-HOW
ROTARY BEAM
FULL GALLON

Without the first, like HZ1XXX, you might as well fold up your tent and silently steal away. Operating know-how comes with experience and covers such things as calling a DX station OFF his frequency, calling him when you are sure he has signed off from a former QSO and is listening for calls. A knowledge of propagation conditions existing at the time enables you to know what to expect from where. The third item, the beam, usually gives your signal a 10X boost in a given direction whether you run ten watts or a thousand. The beam boys are unanimous on the quote "How did I ever get along without it before." The beam is almost as important in reception as it is tossing signals where you want 'em. The full gallon, while nice to have, rates least importance in this line up.

The audibility of a KW signal at a DX point, while goverened by other factors, is extremely small over one of 250 watts or even less power. We will stray from the point a bit in saying a KW signal close at hand is quite a damper to the "would be" DXer of low power who would be quick to agree with those who advocate a power limit of, say, 150 watts would go a long way in making the bands more livable.

On the receiving end any good, middle priced, receiver, having an xtl filter should do the trick "as is." Active DXers seem to pop up the minute a rare one shows because they are continually doing a WHALE of a lot of listening . . . This discourse is given with the 28 mc band, and especially, the 14 mc band in mind. On these bands beams are mechanical possibilities and DX is, more or less, rampant. Of course 7 mc and 3.5 mc must not be overlooked for DX possibilities and are at many times the best bands for those rare ones.

To get back to earth, have faith in your 35 watts, Russ, with a simple dipole it will put a signal anywhere on the globe as proven by the exploits of other QRPs such as W2QHH, W1EYP and VK3NC . . . See you in the Honor Roll!!!

At Time Of Writing

Our latest on EA9DC (EA8AW), from XE1AC, is that Crescencio should have shown up in IFNI on Feb. 18th 14150 A3 only. Apparently no cw op will accompany him . . . John Wylie, 5A2TH **(MD2AM, W4OJE)**, informs us as follows: The new government of Libya authorized amateur radio on Jan. 26th when prefix allocations arrived. **MT2EX**, now **5A2TG**, who issues licenses designates 5A2C- for Cyrenaica and 5A2T- for Tripolitania. No provision has been made for the third part of Libya, Fezzan. (After profound thought we suggest 5A2F-). 5A2TH takes over as QSL mgr. for the 5A2T-s, See QTHs. For the 5A2C-s we suggest QSL via RSGB. 5A2TH returns stateside in March '52 and desires any 5A2TH or MD2AM QSLs to be forwarded to the W4 bureau . . . **KT1OC** advises on the EK/CN2/KT1 licensing as follows: The

No stranger to the DX gang is Bob Baird, W9NN, Des Plaines, Ill. Bob runs PP 810's for a cool KW.

DX Editor. Address all mail to KV4AA, Box 403, St. Thomas, Virgin Islands.

US State Dept. has authorized the Tangier legation to issue calls to US licensed amateurs from KT1AA thru KT1ZZ and KT1AAA thru KT1ZZZ. Novice class calls will be WT1AA thru WT1ZZ and WT1AAA thru WT1ZZZ. To date only two CN2 calls have been issued, CN2AA and CN2AT, other EKs can continue operation until given CN2 calls. KT1OC also advises that **KT1DD** is active on SSB around 14360 . . . **VK3KB** recd QSLs from **C3MY**, see QTHs, 4W1AC and FG7XA. Alf quotes from a Sydney paper, Feb. 4th as follows: RAAF men just back from Cocos Island described conditions there as "deplorable" This was part of a group of 450 sent to repair runways, all were medical cases . . . Following this up, Alf had a word with the PMGs Dept. Wireless Branch and it seems Cocos is outside the administration of Australia, thus, radio licenses would be issued by either the Administrator, Cocos, or the UK. There was no further word on the activities of ZC2AA . . . **VK4QL** considers himself very lucky with a QSL from VU5AB, ditto Frank. Only other QSOs reported with VU5AB, 7015, who is G2FRM, were by F7AR and ZS6BJ . . . **W1BTE** entertains hopes of setting up shop at T19, Costa Rica's Cocos, some time next year. We understand that KS4AQ has the same idea. Any others? Let's get together on it . . . **FB8BD** is now active, 14100, we hear **FD8BB** is due to return to La Belle France . . . **CN8FZ**, ex HZ2TG, KL7PL, W9MRS is now active on 14006. Russ says he will QSL 100%. Send his cards to WØDIL.

VQ8CB vacations in July. This is hush hush stuff so he will bear watching!!!! **LB6OA** advises, via W2AGW, that **LB6XD** is the only active one on Jan Mayen. We hear, however, that **LB6ZD** is also active active there until July . . . **W4KRR** reports hearing **ZD7AB** 0300, sometimes 047 but mostly 063. Fred heard him calling a ZD8!!! We have word from **ZS6BW**, via W5ASG, that a DX expedition to ZD7 is in the making. This expedition, financed by ZS hams, plans to leave for ZD7 land on Sept. 23rd for a stay of two months. Costs are estimated at $400.00 and contributions are limited to 5 shillings for each ham. Care to help a buck's worth? . . . From **W5JUF** we learn that **FE8AA** returns to Cameroons in March with an 813 final in his A3 rig . . . **VQ2JW** writes W5EFC that he is now located in **BAROTSELAND** and is the only ham in that neck of the woods. Jimmy expects to be issued a new call as Barotseland is not a part of Northern Rhodesia altho administered by same; as is ZS3. Mebbe a VQ7 or ZSØ could fit in there hey???... See QTHs . . .

Here is the neat setup of W1EYP, Paul Demergy, Lynn, Mass. With a QRP input of 20 watts Paul has done himself proud with 112 countries and 33 zones.

From **VE3CCK** we learn that **VE3BJD** and himself will make a trip to FP8 this summer planning to operate on all bands from 3.5 to 50, phone and cw . . . From **W1NWO** we hear that **FB8XX** is again active while another op. Morbe, is en route the France with QSLs . . . also **FQ8AH** is at GABON and **FO8AD** on the island of RAPA, 790 miles from Tahiti, these will be new ones for the French possession award DUF . . . TA2EFA is W2EFA and XYL is **W2GEZ** located at Izmit, 400 mi west Ankara, QSL via TA3AA . . . **PX1YR** has been heard on 75 A3 with the xmtr left him by the 7B4QF gang. Yves runs 7 watts on 3.5 and 7. See QTHs . . . From **FF8AG** we get the following low-down on FF8 activity:

FLASH—

KG4AF just reported that VP5BP is active again in the Caymans. QSOd 1700z 14172 A3. He will be there about three weeks. QSL to VE3 bureau!!!

FF8AB, Dakar, CW
FF8AC, Port Etienne, CW
FF8AE, Port Etienne, CW
FF8AF, Abidjan, Unheard recently
FF8AG, Bamako, Sudan, CW
FF8AI, St. Louis, A3
FF8AJ, Bamako, Sudan, CW
FF8DA, Dakar, CW/A3
FF8MM, Bamako, Sudan, CW/A3

Here and There

KG4AF nabbed **HE9LAA** 041 1830z, Burt now has 140 for three months operation at KG4 . . . **ZK2AB**, upon his return to Niue last July was greeted by a terrific accumulation of QSL cards acknowledging QSOs on 14 mc. He regrets that hs call was pirated and states he was on 3.5 mc, only, from Dec. 9th to Dec. 18th '50. ZK2AB expects to be on 14 mc shortly with 100 watts and promises QSLs to all contacts . . . **G6RH** adds CR8CC, ZS2MI and FB8BB to reach 233 . . . **W9YFV** is rebuilding final after trip to Fresno get-together. Ed has added FQ8AE, EAØAB and VK1BS on 20 and works stuff like ZE2, EA8 and VQ2 on 7 . . . **FF8AC has left for a six month vacation** in France after which he will return to the old stand. Ivan promises QSLs for all upon receipt of their card . . . In a QSO recently **VS6CG** reports no C3s heard in the last two months . . . **VK3CX** nabbed PJ1UF while **VK2YI** adds two new ones, KR6IA and KV4AA . . . Scotty, **W3PGB**, whose fist is well nigh unparalleled with the W6DPU keyer, adds an 75A2 receiver, the old 75A1 goes to W3AWX . . . **VK3YP**, now doing quite some traveling between VK2 and VK6, reports 621 postwar QSOs with G6YQ . . . Using the 14 mc Helix, **W8YIN** grabbed VQ5CW, FF8AE, FQ8AF, VQ2JN, VK9KX, and others . . . **W2DKF** adds ZD6DU.

W2QHH hooked VQ4CM and **CX4CZ** on 3.5 making it 92 there for Howie . . . **W4BRB** is up to 97 on 3.5 with CT2BO . . . **W3HWT/6**, ex CN8ED and W4IJW, is now active in Monterey, Cal. . . . **WØDU** hooked **EAØAC** while **W6BAX** QSOd OY3IGO . . . **YN1AA** reports that Wayne Cooper, **W6EWC**, is now YN1WC(?) on 20 and 75 A3 from Managua . . . **CE3AG** is now all set in new QTH with fine signal as usual . . . **Here's** a reminder that **WØELA** plans to try VS4/5 again and should leave this month . . . **LU9CV** made flying visit to NY and hobnobbed with W2CTO, W2UNR, **W2AGW** and W2BJ . . . 3 U.N. stations of the 4UA group are known to be active, they are **4UAD**, New Delhi, **4UAJ**, Jammu, Kashmir and **4UAK**, Rawlipindi, Pakistan . . . **W2AGW** nabbed LB6XD for No. 228 while W3JNN hooked LB6XD A3 . . . **HL1AA** was heard by **W6IBD** recently S8 7018 1600z . . . Buck, **W4TO**, added QSLs from **FD8AA**, VQ1RF.

W2BJ added ZD6HN and FD8AB . . . W7OY advises that LB5ZC will return to Jan Mayen but is on the lookout for a better rx. The old one, a four toober, was OK for locals but tuff on DX. Eddie was happy to nab OY3IGO and ZS2MI from his bedside lookout . . . Dave, **W4AZK**, recd letter from W2CTI stating he has recd 4 QSLs for KC4AB but knows nothing of the guy. Better scratch that one . . . **W2APU says the A3 boys will be glad to**

know that **CR5AA** desires A3 contacts and may be heard on 060 around 1800z, cw, soliciting them. QTH is Port. Guinea, not Principe . . . **W2PRN** adds CR5AA and ZD2HN . . . **W1BIL** says DX is coming hard but reports QSOs with 9B3AA, ZS3E, FQ8AK and VK9XK.

W2AIS came thru with IS1AHK, ZB2I and ZE4JA, making him 100 on 7 mc. Pat also nabbed CN8FN and CT2BO on 3.5 . . . **WØTKX** snagged ZP2AC . . . Heard at **ZS2FR** were VP4TR,CO2FA,KL7AJW,MP4BBD,MC1FG and EL7A . . . **W1ZB** stopped off at VP7NM while W8UOD visited W4RBQ. We neglected to thank Buck for the fine photo of FF8AG in the Feb. issue . . . **SM5AQW** writes advising condx fair on 3.5 but USA openings few. Gunmar QSOd OY2Z, PY7WS, 4X4CJ. EK1CW and EK1AO there . . . **YV5AB** adds ten news ones on 14 A3 bringing him to 39-139 . . . **W3EPV** goes to 219 with 4W1AC,FD8AB,VQ1RF,PX1AR and SV9RP . . . Newspaper articles have been noted chronicling QSOs between W2NSZ, W9DJJ and W2ZXM/MM. The latter being our rugged friend, Capt. Kurt Carlsen . . . **W4CYY** submits 13 new ones bringing him to 40-176 . . . **W6RW** adds 5 making it 4-209 . . . **W3EVW** nabbed FB8AD for No. 151 A3 . . . On visit to ARRL **XE1AC** was advised that status of XE4 would be decided by joint action of RSGB, ARRL and CQ. A1 added CR5AC A3 to bring him to a phone tie with VQ4ERR at 213 each!!! . . . **W9ANT** moves to 225 with FB8BB and FD8AB.

4X4RE adds EL2R, VK1BS and ZP1BL giving Egon an even 200 . . . **W4RVU** was one of the lucky few that nabbed 3A2AD . . . **WØRAJ**, just returned from Cyprus reports that **ZC4XP** says the band opens there two hours a (good) day for both east and west (USA) coasts but Sid gripes about European QRM in general and I QRM in particular . . . **W4HQN** got his call of W2OJM back again . . . **W1BTE** hooked VQ2AB for what Irv hopes will be QSL No. 100. Also heard chewing with Buggy were W1HE, W8ZWX, W2PJS and W2YQ . . . Fung, **VS6CG**, plans to have full 150 watts going in August. He reports W6s coming in on 7 mc from 1500 to 1600z . . . **W3WV** reports **ST2HL**s home QTH is WØPBW, Boulder, Colo. . . . **FL8BC** hasn't been heard for some weeks now, according to VQ2AB and OQ5RA . . . **ZS6RI** nabbed EL2R, see QTHs . . . **ZD1SD** 100, uses a suitcase xmtr which came in handy in the last fracas. See QTHs . . . **VP7NZ** turns up at Grand Bahamas, he is W6KYT and says QSL via W6NZ . . . **W2GVZ** went to 167 with ZD1SD and FD8AA.

K2USA nabbed VQ4HJP on 3.5 while **W2LWI** hooked CT2BO 3550 . . . **WØVDC** finally has TVI licked and celebrated by grabbing EL7A . . . **W9AND** reiterates he handles **FY7YB** QSLs and presently has logs from him to Oct. 29th, '51. A new receiver has gone forward to FY7YB from AND . . Wes added ZS5U, EA1BC and GD3UB to bring his 3.5 total to 49. He also reports that **SM5LK** is doing nicely in Sterling, Ill., but has four years to wait for a W call. Doc Lowey, an old pal of W2PF, dropped in on KV4AA . . . **VK3CX** reports the arrival, in Reunion, of **F9EJ** who should be getting his FR7 call soon . . . **W7BD**, tired of chasing DX on the ground plane, now sports a four-element beam using folded dipoles on each element and fed by No. 18 wire. This resulted in hooking FB8BB, EAØAB and others, nice going E1 . . . **W8ZY, W8DUY** and **W9ANT** went to work on W8WZs receiver and Doc nailed ZD6HN during their stay . . . **W4SXP** writes that 28 mc is not entirely dead and he has managed to pick up 7 new ones on A3 including KB6AR,CR6AT,3V8AX,MD2AM and VR2CG. Ralphs QSL to REF for FS8PR QSO was returned as "unknown" . . . **WØFID** says school has been limiting his DX but hopes to be on from **KØWAW** on Univ. of Minn. campus. Dick now sports DXCC No. 1418 . . . We wish **ZS6BJ** a speedy recovery after undergoing leg operation . . . **W5ASG** recd QSLs from HC8GI and OY3IGO for 208 confirmed. Can anyone give Bill present QTHs of YJ1AB of '47 and VRIG '51 ??

W3DKT adds ZD6DU and ZS8MK making it 204 . . . **OZ7BG** adds 7 to bring him to 151 . . . **W8FRD** polished up his 20 watter and worked KH6IJ, KH6MG, FA8BG, G8JR and G2BFK on 3.5, nice going A1 . . . **W2WZ** added ZS2MI for 219, A1 wants QSL from **JAØIJ** . . **W3CCU** adds 10 to arrive at 219 . . . **W1DPJ** nabbed TA2EFA 7 mc and VU2CP, FD8AB, **KR6AF** and **ZP2BF**.

Some of the 40 odd DXCC-ers attending the recent get-together.

Via VK3CX here are the present leaders in the VK-WIA DXCC:

CW Only		Phone Only		Phone and CW	
VK3BZ	200	VK3EE	158	VK3BZ	213
VK3FH	172	VK3JD	155	VK4HR	194
VK4EL	163	VK3BZ	154	VK6RU	181
VK4HR	161	VK4HR	153	VK3JE	180
VK2EO	152	VK6RU	148	VK3HG	180
VK3CN	151	VK6KW	145	VK2DI	170
VK6SA	150	VK4KS	135	VK3KX	167

George mentions the following activity in Maine: **W1LBF** has phonitis now that he has wkd 160 on cw and is close to phone DXCC. **W1APU** needs just a little more paper for DXCC. **W1DLC** is going strong with new rhombic while **W1BPX** is still knocking them off on 80 . . . **HP1AB** dropped in on KV4AA who also expects **W3MSK**, W4OSU and W9FJB to visit during Feb/Mar . . . We are pleased to note that Hamish and Fergie, **G5PS, G2ZC**, are continuing their affiliation with the FOC (First Class Operators Club) as Veeps. Congrats . . . **W2GNQ** grabbed JA2KG, JA2MI, CR4AD, and ZS3E A1 and then phoned with CR6AJ and KT1CH . . . **WØRBA** sends in 7 to reach 151. Jim reports that WØPNQ leaves for far east and hopes to get on from JA (HL1 ?) . . . **WØTKX** reports crd from ZD6DU who is ex G2HDU.

W2BXA and **W6MUR** are now active from new locations . . . **W9NN**, after 32 year QRX, tuned up on 3.5 and reports there are actually CW stations there!!!! Bob also advises that W9CKU nailed ZB1AB,ZS5FY and DL4FG on 7 mc. **W9WEA** should be back on soon with a vertical ant . . . We hear from **W6UZX** who has not been too active of late. Jim advises that **PK4DA** and XYL will arrive at his QTH for a three month stay early in May. PK4DA will then travel east and later go to Holland after which he will return stateside for permanent residence. Jim, who handles PK4DA QSLs, states he will not ship out any for QSOs held after Dec. 21, '50, but will hold such requests for same for PK4DAs disposition.

PY1ARZ, who was expected at W6BAX was suddenly called back to Rio from N.Y. . . . **VK5MY** reports QSO with 9B3AA . . . **W2PRN** worked the A3 sigs of ZD9AA 2030z 148, also, ZD4BF A3, 2030z 138 . . . **W6SN** added FD8AB for No. 234 while WØHVN wonders about QSL from PX1AB QSO'd Dec. 1st . . . **VE3JJ** nicked HC2OS for a new one . . . **W5MET/MM** arrived home for a short stay and reports 73 countries worked on 28/MM since Nov. with a 2½ hour WAC in the Red sea with OQ5VD, ZC6JM,ZB1AJ,HC1KV, VK5TS and W4NQN on the receiving end. Dick reports VU hams still pick up surplus 813s for three bucks and BC348s for twenty bucks in Bombay. He visited VU2GB and picked up overdue QSL!! That's one way to get them . . . We wish **W2ZJ** a speedy recovery from his recent heart attack . . . **W6ADP** is struggling along with 120 watts and ground plane ant.

in new QTH . . . We regret to chronicle the passing of Mr. Salles, **PY1BG**, a DXer known to all of us. Mr. Salles was in charge of the LABRE traffic Dept. and held DXCC, WAZ, WAS, WAA, and WAB certificates . . . **W6VFR** added FD8AB for No. 242 . . . **WØSOK** runs 35 watts while rebuilding.

THE DX GRAB BAG

Giving a resume of DX stations worked or heard from North America. Times are GMT and abbreviated freqs. 14 MC.

C.W.					
CE5AW	040	0745	VK1BS	050	1900
CN8FZ	005	2330	VS6BA	080	1950
CR7AN	110	2050	VP3FD	050	2000
CR7CD	059	1845	VK9XK	120	2240
CP1AX	002	2050	VP5BF	037	0215
CT1DJ	7012	0030	VU2EC	022	1450
CT2AB	045	1730	TG9CR	078	2310
CT2BO	3548	0100	VQ4FCA	080	1830
CT3AA	047	1725	YV5AB	7022	1110
EA6AM	096	1925	YS10	038	1300
EL3R	001	1930	ZD2HAH	065	0450
EL7A	002	2310	ZB2I	050	2045
EA9BD	075	0255	ZD4AB	7020	0700
EAØAB	065	2130	ZS8MK	030	1735
EAØAC	070	2245	ZS2MI	049	1835
EA8BI	027	2035	ZK1AB	7035	1115
EK1AR	074	2035	ZD4BH	078	0000
EQ1BC	098	1500	ZC1AR	069	1745
FI8YB	075	1830	ZS3K	7024	0505
FR7ZA	020	1340	ZD2JAB	019	2310
F9QV/FC	020	1450	ZS5U	7019	2350
FB8ZZ	050	1415	ZS7D	086	1840
FQ8AN	042	2015	4X4RE	082	1315
FO8AC	060	0030	5A2TN	061	1940
FD8AB	022	2305	5A2TP	072	2130
FK8AI	078	1830	9S4AX	015	1750
HH2L	035	1900	**PHONE**		
HR1AT	014	2020	CR5AC	156	2320
HE9LAA	048	1720	CR5AA	060	2030
HP1AW	3555	0410	CR6AJ	385	2030
IS1CNQ	075	1840	CR6AM	148	2115
JA8AB	072	2350	CN8FZ	205	1920
KB6AQ	058	0025	AR8AN	210	1420
KM6AW/KS6	052	0630	GD3GBG	325	1350
LU4ZI	040	2135	HR1BG	3790	0600
MI3US	028	1800	HZ1TD	350	1415
MI3VG	076	1435	KT1BB	340	2315
MP4BBD	084	1320	MI3RK	192	1515
OQ5RA	012	1915	MI3US	163	1450
PJ5TR	024	2340	OQ5CX	28200	1430
PZ1WK	007	2400	OX3MW	355	2315
OE13SC	000	1800	SP5AB	127	1600
ST2HL	060	0330	TA3AA	370	1805
ST2VL	078	2005	TA2EFA	330	1600
SV1SP	075	1800	TG8IH	3790	0450
SU1GO	100	2035	VQ4RF	384	2115
TF3AB	020	1640	VP2IE	338	2100
VP5BH	7002	1100	VQ3CP	390	1945
VP6CDI	027	1120	VK1BS	255	1930
VK2DI	095	1130	VP9HH	325	1430
VK2ACN	015	1130	VU2CN	335	1435
VP8AK	7005	0030	W4CG/KV4	235	0700
VU5AB	7015	1600	XE1QB	3795	0430
VP7NZ	7010	0420	YI3BZL	175	1310
VQ2GW	090	1955	ZB1AJX	145	1430
VQ5CW	035	2100	ZD9AA	205	2030
VP8AP	042	0630	ZP3NB	280	0305
VP9JJ	7028	1045	ZK2AA	170	0430
VP8AU	056	0020	ZD4BF	127	2030
VU2EJ	030	1440	ZS2MI	370	1855
VQ4CM	031	1525	ZD4AX	150	1840
VQ4BB	024	2050	ZS8A	316	1850
VQ4RF	079	1945	ZP1AE	270	0330
VP1AA	010	0100	5A2TH	370	1830
VP8AO	005	0035	VP5BP	172	1700

From W6AM we hear the annual North/South California DX club in Fresno was a huge success. It was attended by 75 members in spite of heavy moisture. Two days of DX talk (any other subject is taboo) were highlighted by W2/8IOPs narrative on eastern DX, W6QDs talk on world wide subjects, W6SAIs commentary on his PX, 3A2 trip shown on color slides and W6ENVs straight forward description of his 238 country TVI proof rig which gave a big lift to everyones TVI hopes. Special car carried the SC gang from LA along with several visiting eastern DXers. W6TT and W6DUB had four room headquarters so that the gang could all be found in one place between meetings. Next year's session will probably be held at the Californian Hotel, Fresno, Jan. 17/18, '53.

W5ADZ reports the Houston DX roundup, on Feb. 4th was attended by 19 members. The guest of honor being VS1AY.

From W1MB we hear the Massachusetts DXCC member meeting, on Jan. 31st, was attended by over forty DXers including such well known calls as W1FH, W1QF, W1JCX, W1ZW, W1HKK, W1NWO, W1HX, W1TW, W1NAV, W1AXA, W1KKP, W1LOP, W1JOJ, W1HE, W1ENE, W1IAP, W1ADM, W1BPH, W1MB, W1MUN, W1QVC, W1BUX, W1LQO, W1BOD, W1KNU, W1FFO, W1QXQ, W1LQ, W1LMB, W1BIA, W1BLO and W1FFO. A swell time was had by all.

One Sixty

Conditions during the Feb. 17th tests seemed similar to that of Jan. 6th with a short DX skip prevailing. VE2WW was heard wkg GW3ZV during early part. W9NH 589, VE2WW 579, VE1EA 569, W8BKH 578, W2FYI/8 479, W1LYV 579, W8AQ 469, W9CVQ 57/89 and W2EQS 569, all QSO'd KV4AA. . . . W2QHH pulled a nice one out of the hat by QSOing GD3UB (1793) 0650z. Vic uses a 264 ft. dipole which seems to give better results than his rhombic.

QTH COLUMN

OE13SC Jim, APO 168 N.Y.

EL2R Roger Harrison, Roberts Field, Liberia.

LUØDDH Argentine Ship "Mendoza" via RCA Bs.As.

CN8FZ Via WØDIL

VQ5CW Michael Paveley, P.O. Box 89 Jinja, Uganda.

9S4BE Roman Mayer, Am Galgenberg 26a, Elversberg/Saar

ZD1SD Steve Donaghue, Royal Signals, Freetown, Sierra Leone.

VP7NZ via W6NZ

KV4AQ Dr. Randy James, Box 73, Christiansted St. Croix, V.I.

C3MY Martin Young, Ming Jih Yang, P.O. Box 16, Taichung, Formosa.

FK8AL Jean Garbe, 26 QL Noumea, New Caledonia.

FK8AH Robert Garbe, 26 QL Noumea, New Caledonia.

FK8AM Francois Coursin Anse-Vata, New Caledonia.

FK8AN George Courtot, Electric Radio, Noumea New Caledonia.

5A2TR QSL Mgr. 5A2T-s. M/Sgt. Ed. R. Halverson, 34th Radio Sqdn. APO 231, PM, NY.

5A2TH/MD2AM Via W4 bureau.

FQ8AF P.O. Box 218, Brazzaville, AEF.

(Continued on page 58)

the VHF news

Edited by
W. E. McNATT, W9NFK*

Norman A. Hansen, W2UDD

Norman A. Hansen, W2UDD, Buffalo, New York, was killed in an automobile accident in the early hours of January 21, 1952. An ardent VHF man, Norm's 200 watts and 20-element array on 2 will certainly be missed, as will be his fine personality and character.

A new theory for the propagation of VHF radio waves beyond the horizon has been announced by the National Bureau of Standards. Developed by Dr. J. Feinstein, NBS staff, the theory not only accounts for VHF and microwave signals that have been observed at distances beyond the horizon but explains the natural and inevitable — as against "unusual" or "accidental" — occurrence of such transmission. The theory has significant, practical implications with respect to television and other high-frequency communication services, according to the National Bureau of Standards technical report.

The theory applies to frequencies of 100 mc and higher. Until the advent of Dr. Feinstein's theory, the general concept of propagation has been that the limit of transmission range is just beyond the optical range, or equivalent to a surface range produced by 4/3 earth's radius, except for instances of "extended-range" propagation. Signals far beyond the radio-optical horizon have been explained by previous theories on the basis of unusual meteorological conditions or unusual inhomogeneities in the density of the atmosphere. For example, the NBS report states, some investigators have explained the phenomenon by the presence of "ducts" or "channels" in the atmosphere having a density which differs from the air above and below. Such theories have not accounted fully for the regularity of the phenomenon. *(VHF Ed. Note: In general, meteorologists who are also VHF—144 mc—operators have accounted for extended-range propagation by correlation of "M" gradients or by unusually intense Sporadic-E occurrence. Such correlations have been identified, however, with propagation paths much greater than normally encountered over the 4/3-earth's-radius-plus path.)*

The theory developed at NBS suggests a new role for the gradual change in the refractive index of the atmosphere with height. This change, or gradient, leads to reflection as well as refraction of VHF waves as they travel into space from the transmitter. The amount of reflection is small, but it is enough to lead to appreciable propagation of signals beyond the horizon.

NBS is proceeding with experiments to develop the theory. Initial observations corroborate the Feinstein theory in regard to frequency, angle dependence, range, etc. The fundamental hypothesis assumes the earth to be a perfectly smooth sphere possessing an atmosphere which gives rise to a refractive index that changes exponentially with heights. Thus, NBS will make efforts to develop a more complete theory and confine the approximations.

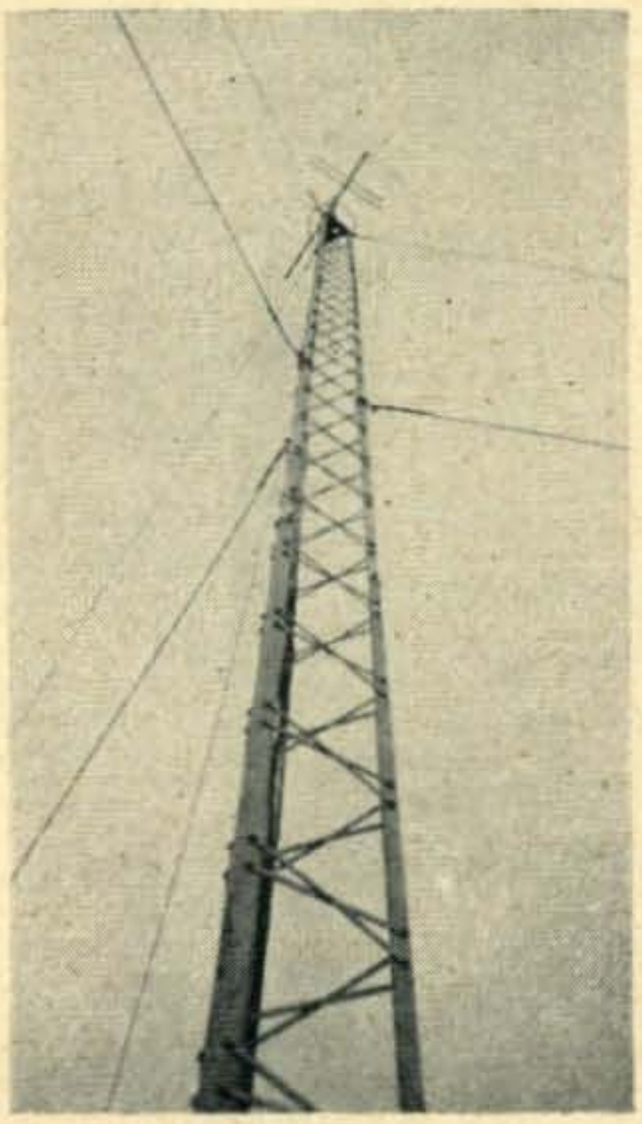
Six Meter Notes

50 mc news isn't very copious, this time. Don't wait for the big openings to tell us what's going on, fellows.

W2RLV reports 45 states, 10 call areas, VE1, 3, 4 and 7; KL7, PAØ, G, LU, HC and XE for "The VHF DX Scoreboard." Likewise, **W7DYD** reports 45 states, 10 call areas and 3 countries. Herb needs Vermont, Alabama, and Arkansas for WAS. He is active on 6, only, and reports **W7's KO, EVO, MIG, NQM, GFM, FAW, FIM, BYK** and **KQG** also on 6 in the Seattle area . . W7BYK is building a new mobile rig which will include 50 mc . . . **W7FIM** will have an 813 final on 6 . . . **W7DYD** is polishing off a new double super for 6. It uses 15 tubes and a crystal controlled oscillator.

W8KZT, Cheviot, Ohio, reports his "Scoreboard" total as 33 states, 10 call areas, VE1, 2, 3 and 4; CO6 and VP7 for 4 countries. Len now uses a 2-6-10 transmitter utilizing a 6AG7 - 2E26 - 829B to replace the old 6AG7 - 829B rig. The beam consists of two 3-element 6-meter Yagis stacked ½-wave apart.

W8CMS enjoyed the December - January 1 openings working the VE and W1 gang, but says the band was



Looking up the 60-foot tower at W5IVU. The beam is a 50-ohm copy of the well-konwn 5-over-5.

**VHF-UHF Editor. Address correspondence to 2433 Elder Lane, Franklin Park, Ill.*

dead all the rest of the month. Claire reports that he and Tom Stence, W8NQD, have had 1203 QSOs on 50 mc during the period March 17, 1948 to January 31, 1952. The path is 80 miles. Claire says activity is low around Newton Falls. There are, however, a number of "summertime soldiers" who only get on the band during the summer months.

The "Scoreboard" total at W8CMS is 42 states, ? call areas and 9 countries.

W8NQD was laid up with flu in January and didn't do much on six. Tom's 6-meter score is 45 states, 10 call areas and 7 countries. He needs Deleware, Utah, and Nevada. Tom would appreciate it if that W4 in Virginia would kindly QSL. What can be done about these non-QSL stations; shall we pray for them or heap ashes upon their heads?

Tom's log shows a total of 5105 QSOs on six meters since W8NQD went on the band in 1947. "Not too bad for a 'dead' band," says Tom. "Rarely do we find conditions that do not permit a good contact. The trouble with Six is that we don't have enough stations active to find out just what our range actually is! At one time, a schedule with a fellow 200 miles distant worked out about 75% over a period of three or four months, and he ran only 45 watts. I still think these VHF bands have more on the ball than they're given credit for!"

420 Mc Items

W2QED, Ken Carter, maintains his consistent reporting of the "2/3 meter" band. Ken reports that **W3RKQ** has his 16-element array in service, which should produce better signals on the eastern seaboard. Ken continues, "As I expected, activity on 420 picked up after the holidays, somewhat, even though the weather continued wet and cold. Contacts have been made with **W3OWW** and **W3BSV**, 75 to 80 mile paths, but no luck has been had with stations in Washington, D.C., 100 miles away. Schedules are being maintained, however. It is interesting to note that weather conditions affect signals over the short path, 20 to 25 miles, between **W2HEK, W3RKQ,** and **W2QED**. With no changes in equipment at the various stations, signals have been observed to vary between S1 and S9 plus. One would expect this over the long hauls, but I was surprised to find such a great effect over such a short path.

"On January 12, W3OWW was coming in so strong that W3RKQ was able to hear him off the back end of his five-element Yagi, only 15 feet high. Since then, the beam has been raised to 30 feet: a 16-element array will replace it, soon."

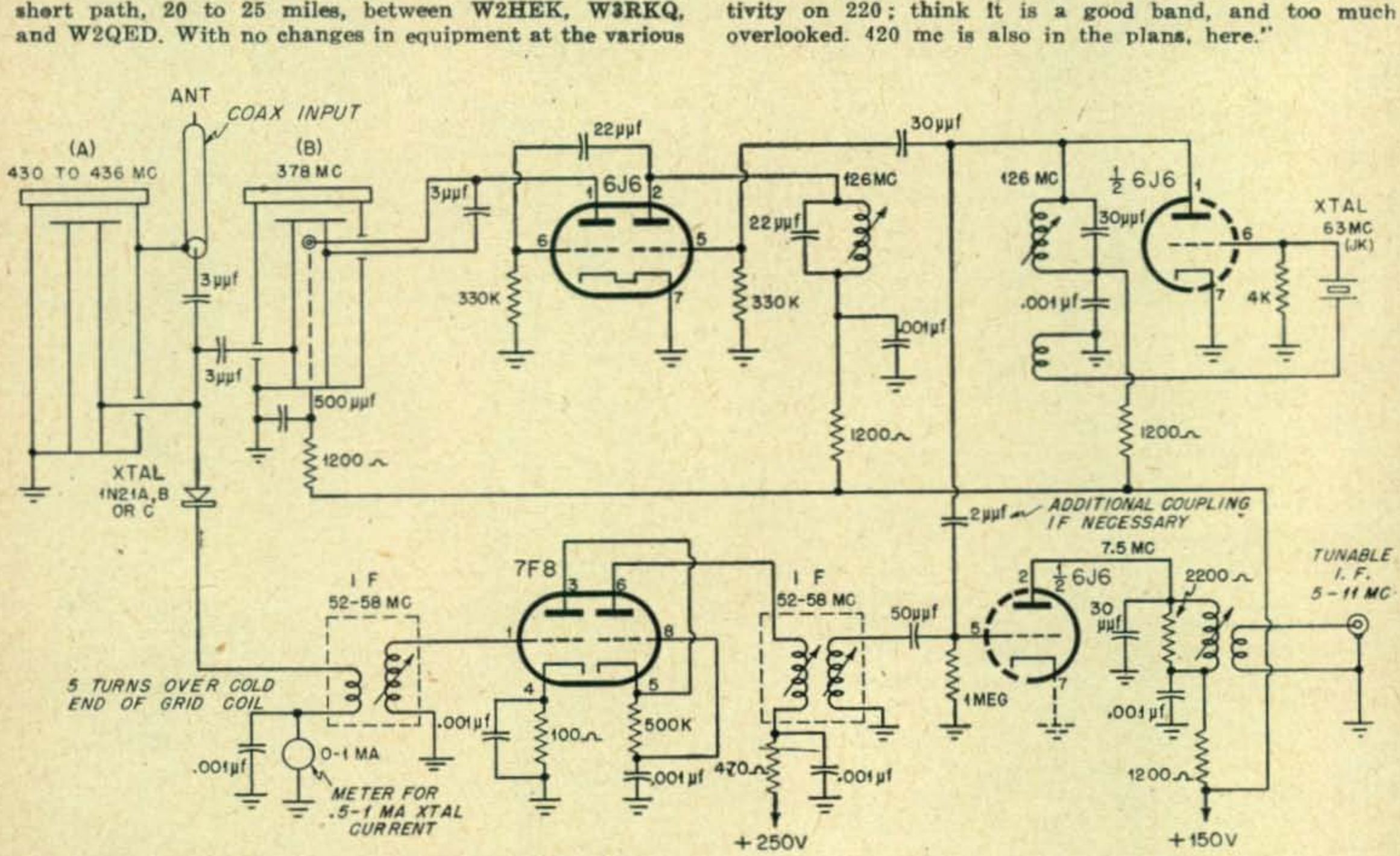
W2QED visited some of the 420 mc gang in early February and exchanged ideas with W3BSV, W3AIR, and W3RE. Robbie, W3RE, is still getting the gear settled in the new shack after his recent move. On his return home, Ken enjoyed a visit with W3LMC, Baltimore, who isn't on 420 mc, but is one of the big 2-meter RTTY men on the east coast . . . 420 mc contacts logged at W2QED for the month of January: W3BSV, W3OWW, W2HEK, W3RKQ, W3NAG, W2BLV and W2EH. During the VHF SS contest, five contacts were made: W3NAG, W2HEK, W3OWW, W2BLV and W2EH.

W8WRN On 220 Mc.

W8WRN reports the 220 mc rig is working in good shape and uses a 6AR5 tritet (8 mc crystal X 3), a 6AQ5 tripler to 75 mc, a 6J6 tripler to 220 mc, a 6J6 buffer driving an 832A, 15 watts input. An 829B has been used with about 25 watts output, but an AX-9903 is scheduled as the "final" final.

The antenna consists of 8 half-waves in phase about 25 feet high, directed towards Cleveland. Reflectors are to be added, soon. TV channel 13 audio is received consistently, and the average signal is S2 to 3. Dayton TV, off the side of the beam, is also heard, and is occasionally the same level as Toledo. One evening, in January, Toledo TV sound was 10 db over S9 at W8WRN. Ken went on 2 and raised W8DQR, Toledo, after much CQing. But, conditions on 2 were very poor and subnormal.

Ken urges, "Let's see if we can't stir up some activity on 220; think it is a good band, and too much overlooked. 420 mc is also in the plans, here."



A & B ARE COAX LINES FROM R89 GLIDE PATH RCVR.
(A) MIXER LINE -- $3\frac{5}{8}$" LONG x 1" ID TAPPED UP AT $\frac{7}{8}$" WITH $\frac{3}{4}$" CENTER LINE DISC AT TOP.
(B) 378 MC LINE -- $3\frac{3}{8}$" x 1" ID TAPPED AT $\frac{3}{8}$" FROM COLD END, WITH B+ UP CENTER OF INSIDE LINE. TOP DISC $\frac{7}{8}$" D.

If you are wondering how to receive those 420 mc signals the Claire Reynolds, W9MBI crystal controlled converter may be the answer. This unit cleared away many of the objections to an earlier model. Claire is now experimenting with a 6BQ7 in place of the 7F8 to improve the i.f. noise figure.

When I was a youngster, we never had much of a place to swim. The creeks were all small and it required that we build a dam. Two or three of us would build one by dint of blood, sweat and tears. Did we get any help? Nawsir, not by a jugfull!

But, when the dam was done, there was plenty of help to do the swimming. So it is with VHF. There are plenty of hams who are willing to work the openings, or make contacts when the band is well occupied, but few who want to help promote things.

—"A Reminder"

Two Meter And Down Club

Ed Luckey, **W6MJ**, reports some "long overdue" (in his words) happenings of the **Two Meter And Down Club**, Los Angeles. New officers, elected in January, are: Tom Miller, W6VBG, president; Frank Reinsch, W6RJB, vice president; Todd Brown, W6EYN, secretary; Horace Bodine, W6LJO, treasurer; Ed Luckey, W6MJ, station custodian and program chairman.

The club meets every first and third Wednesday at Plummer Park, 7377 Santa Monica Blvd., Hollywood, Calif. Membership runs around 82 active members with some forty "occasional" members. Each meeting features a speaker on VHF, UHF and allied topics.

The club sponsored a VHF contest over the week-end, March 1 and 2, from 1800 to 2400, PST, both nights. Handsome prizes await the winners in the three divisions of the state of California; a special division was set up for Novices. It is hoped that we will have the final results for you in the next issue.

A series of interesting meetings has been planned by the club for the current year. Lectures, motion pictures, and group experiments will be devoted to furthering interest in and advancement of VHF and UHF experimentation and communications. The club sponsors a VHF emergency net on 146.8 mc each Monday at 8 p.m., PST. Net control is W6IHK, Bill Myers. The club is initiating plans to build its own club house and station. All hams interested in aiding this project are invited to contact Tom Miller, W6VBG.

Neil Taylor, **W6MUS**, formerly of San Diego, has been in the Chicago area for the past several years. But, in January, he pulled stakes and returned to California, to work in Downey. Active on the **"147.5 Mc. FM Party-Line Net,"** W6MUS/9-mobile was given a warm departure en route from Chicago, Neil's fellow-engineers at Motorola's C&E lab presented him with a handsome brief-bag and pocket slide-rule at a farewell luncheon a few days earlier. His uncle is W6CFL of L.A.

WN6NJU, Gary Stilwell, has been on 2 since last July with a 522 transmitter and receiver and a 16-element beam 30 feet in the air. He has worked W6's IBS and BYE, San Diego for 125 miles DX. Gary also works on 80 and 11. Keep that c.w. up, OM! . . . **W6WGT**, George Liebig, Riverside, feels the **Faithful Few On Two** idea is negative and will do little to stimulate "much needed consistent activity on the two-meter band." However, George feels that he could qualify for the "F.F.O.T." certificate. "Many times I have turned on my receiver, heard little or no activity: put out a half-hearted CQ. Receiving no response, I pulled the 'little' switch. Many others do the same thing. Result—a dead band.

"The first of the year, I resolved to do better, so I set up a goal of one contact a day on two or, 'One A Day On Two' which, to me, seemed that it would really stimulate activity. To date, I've fulfilled my resolve, and have been surprised that about half of the contacts made were new ones.

"I have started spreading the 'gospel' and, to date, have made quite a few 'converts.' Most of the fellows like the idea, and some have commented to the effect that it sometimes takes a little calling before a contact is made. In the past, after one or two tries, they would have given up and called it a day.

"The only drawback to my plan, if you can call it that, is that it is hard to limit the number of contacts to one a day. Sometimes, I get tied up for several hours at a stretch!

"I suggest that a certificate for 'One A Day On Two' be issued to anyone making contacts on 30 successive days, and a special sticker to be given for each 90 days: possibly, a special certificate to anyone who could make one contact a day for an entire year.

"I believe such a deal would encourage the newcomer, and also tend to keep the band alive," concludes W6WGT.

(**VHF Ed. Note**: Well, George's thinking parallels mine except for terminology of awards for effort. W6WGT's "One A Day On Two" campaign title is an excellent one. However, the practicability of issuing certificates on a 30-day basis, with special stickers to be awarded at 90-day intervals, is not within the realm of this column. The best approach I have is the **Faithful Few On Two** certificate, to be awarded to the VHF operators who are known to their fellow-members to be consistently active over a period of one or more years. Incidentally, the **F.F.O.T.** Certificate is still in the planning, but has been delayed by yours truly being busy, ill, out-of-town. Your nominations are being recorded, and are still requested, however. I'm behind time—according to my own schedule—on **F.F.O.T.—The VHF DX Scoreboard** . . . I've just had too many things more important impressed upon me, including hypertension. I'm supposed to "un-gear" —yet, how can I when I'm so intensely interested in VHF and the **News**?)

W6WGT uses a Wallman Cascode (**Stacy, "CQ", September, 1949**) into a Hallicrafters SX-42, a 522 transmitter and a twin three beam. A wide-spaced, flip-flop twin four will go up, soon: heretofore, all of George's operation has been on vertical.

Topics On Two In Texas

Thanks to Waldo, **W5FEK**, for the nice photos of the W5's in these pages. The activity highlight for the month was the VHF sweepstakes, which brought out a lot of stations. Even Ida Stockbridge, **W5PKO**, deserted the c.w. bands to give the locals a contact after her OM, **W5PKJ**, "Whitey," did a little arm twisting . . . New 2-meter stations in the Houston area during mid-January to mid-February are **WN5TOZ**, **K6FAI/5**—who is now **K5FCN**, at Ellington Field—**WN5UUA**, **WN5URM**, and **W5PAO/5**, Lake Jackson. WN5UUA is the 14-year old son of W5CVF . . . The old a standbys, **W5s IVU**, Edna: **AXY**, Austin; **QIO** and **QME**, Beaumont; and **W5JBW**, Maplewood, Louisiana, were worked fairly regularly but—at 80 to 125 miles—they are no longer considered as DX, even by a lot of the 522 boys . . . **W5GLS**, the area's emergency co-ordinator, is recouperating after a serious operation . . . **W5FSC** still hasn't done any building . . . **W5TAF** now has his 4-65As under control and is completing a 5-over-5 beam . . . **W5ONS**, Victoria, hasn't

W5ON, L. A. "Pop" Hoskins of Houston, Texas.

been very active . . . **W5BDT**, Austin, visited W5FSC and W5FEK on February 10 . . . **W5FBT**, Baytown, visited them on the day before.

Note to **W5ML**: the coastal gang are dubious of the condition of your receiver, following your report of lack of contacts. There are also certain innuendos circulating about "King Arthur Bates and His Roundtable" that can't be broken into, hi! (**VHF Ed. Note**: Well, after writing that, I guess I'll have to stay out of Oil City on the vacation to W5-land, this summer!)

WN5TFW, Port Neches, has been be-labored by an evening shift but reports the Sabine area is active . . . **W5DSB** is back on the air after putting up the beam, again. He has the twin-5 mounted between a channel 2 stacked array and looks at TV while transmitting on two . . . **W5FCD**, Port Arthur, is again active as is **W5AOA** who has his beam up, again . . . **W5CZ**, Lake Charles, Louisiana, should be giving W5JBW some competition by this time . . . Two meters was in good shape on the morning of February 10, with **W5MWW**, New Boston, and Leroy, **W5AJG**, heard very well—but **WN5TFW** was "horizontal on the feathers!" (Asleep, that is, son! O.P.F. told me to explain unique colloquialisms now that I have a couple of more readers than did the old "VHF News".—VHF Ed.)

Alabama Activity

Herb Arnold, **W4FSW**, Birmingham, informs us that there is some two-meter activity in the heart of the south . . . **W4RTI** is using an Eldico rig, running 20 watts, a 5-element beam and a Sonar converter into a Collins 75A2. He isn't on very often, but works out nicely when he does fire up . . . **W4FIG** runs 100 watts to an 829B and has a 5-over-5 beam. The receiver is a crystal-controlled converter into an HQ-129X. Pres is very active on two and has a very nice new ham-shack. His VHF DX Scoreboard total for two is 6 states; call areas and DX-miles not reported . . . **W4FSW** also runs 100 watts to an 829B on 144.138 mc or 144.5 mc. The 5-over-5 beam is 40 feet high and the receiver is a crystal-controlled converter into a BC348. Herb has six states, Alabama, Georgia, Mississippi, Tennessee, Louisiana and Texas. Nightly schedules are held with the Tuscaloosa gang, W4ELX, W4KCQ, W4KUX, W4HCV, W4LRU, W4TXM, W4NJP, W4TLY, and W4GOF. W4FS W's DX miles are 700 . . . Last issue, Tuscaloosa reported; this issue, Birmingham is in. In the future, how about more from the whole Alabama gang?

Is it possible, too, that there is **no** VHF activity in the states of Florida, Georgia, Kentucky, South Carolina, North Carolina, and a few other states? You fellows are welcome, most warmly, to give a few tid-bits of VHF comment—a complete resume, that is—to these columns. The address is given at the bottom of the first column, of this department.

Walter Hotz, W9CT at his operating position. 522 transmitter and improved 522 receiver. (W9NW Photo)

Northern Lights Bring DX to Two Meters 23 February 1952

On Saturday, February 23, one of the finest aurora openings of recent years took place. Starting early in the evening—approximately seven p.m. EST—and continuing until after midnight, this display provided opportunities for DX contacts on two meters over the entire northeast section of the country. Full reports are not available at the time of this writing, but the experiences of W4AO, of Falls Church, Virginia, will illustrate the scope of this opening.

W4AO reports 27 QSOs, with seven U.S. call areas plus VE3; best DX to (WØKYF) was approximately 700 miles; a new state, no. 18 (thanks to W4PCT in Kentucky)—all on two meters! W4AO was running about 800 watts input to a pair of 4-125s in the final, using a 32 element horizontally polarized array.

W2PAU reports a QSO with W9EHX, 760 miles, plus numerous contacts into the Detroit area. Best results at W2PAU were noted with the beam considerably to the west of north.

Relatively little activity was reported from the New England states, possibly indicating that aurora was centered somewhat more to the west than usual. More details later . . .

Canadian Capers

VE3BQN, DAA, DAN, DHG, DLW, and **AIB** are busy building and experimenting with 420 mc gear. **DAN** still keeps regular schedules with W2ORI on Sundays at 2130 EST. **AIB** has a pair of 8012s operating and had his first 420 mc QSO with DAN on February 17. Reporter Iris Weir, VE3DER, says the gang is wondering who will be the first VE3 to work western Pennsylvania and Ohio on 420.

Six meter activity in the Toronto area has been low. due—partially—to the TVI with receivers using the high-frequency IF in the vicinity of 45 mc. It is hoped, fervently, that manufacturers of TV receivers will do something to alleviate this problem. (**VHF Ed. Note**: U.S. state government services are now operating 3 kw. FM communications in the 40—50 mc range. This may focus attention on the TV high IF system in the very near future.)

VE3BCC wonders if 6-meter activity would not be furthered if the U.S. amateurs who operate during the daytime hours would put their beams toward Toronto after contacts in that general direction, or listen on the hour. Mr. Smart has heard W5AJG, both phone and beacon, but when he was in QSO, he turned his beam elsewhere **directly** after his QSO. Also active during the day, listening, is **VE3DEA**, Toronto. As for VE3DER, it is not too convenient, just yet, for her to operate during the daytime . . . **VE3BOW** reports a new station on 2 meters in Hamilton, **VE3DAL** . . . Continuing the report, in the last issue, of the fifth Southern Ontario and Western New York VHF Group meeting at Oakville, Ontario: the speaker of the evening was Tom Swafford, **W5HGU**, who described latest techniques used on 420 mc, particularly with reference to low-noise receivers using crystal mixers. Attendance was comprised of three VHF men from Rochester; four from Niagara Falls, N. Y., **VP2GG**, Island of Grenada, B.W.L., eight from the Galt, Brantford, and Kitchener area, five from Hamilton, and four from Oshawa. The remaining 58 of the 90 present were from the Toronto area. **VE3DMN** and **VE3DER** were the XYLs present.

The annual presentation of the trophies for Two and Six meters was made. **VE3AQG** handed the **VE3BQN Two-Meter Trophy** to **VE3AIB**, who should have received it following the last contest. Then, after holding it for a brief period, Les prevented the trophy to **VE3DIR**, who had the creditable number of 90 contacts on Two Meters, only. He is to be commended for the noble effort . . . **VE3ANY** held the **VE3BOW Six Meter Trophy** for a second time, with a score of 38 contacts on Six Meters, only. Gord must win this trophy in the remaining two contests in this year in order to retain the trophy **permanently.** This stipulation applies also to the Two Meter Trophy . . . The meeting concluded with the presentation of the **Sacrilegious Order of The Bathtub Plug** to the hapless ham who perpetrated the most foul deed during the January contest. (For details of induction into the order, see **CQ** March, 1951.) The winner, each year, is for all time, and there is a new winner each January.

This year, according to VE3DER, one of the faithful VHF contest participants in the Toronto area talked to a few of the boys about the 420 mc contact he hoped to make. When the contest commenced, he was conspicuous by his absence. He had **forgotten** the contest date! When the presentation of the award was to be made, he was also absent. Since then, I have learned that he was ready to come, but a last-minute circumstance prevented it—he says. And, at least, he got on Two for a few contest contacts—thanks to a phone call!

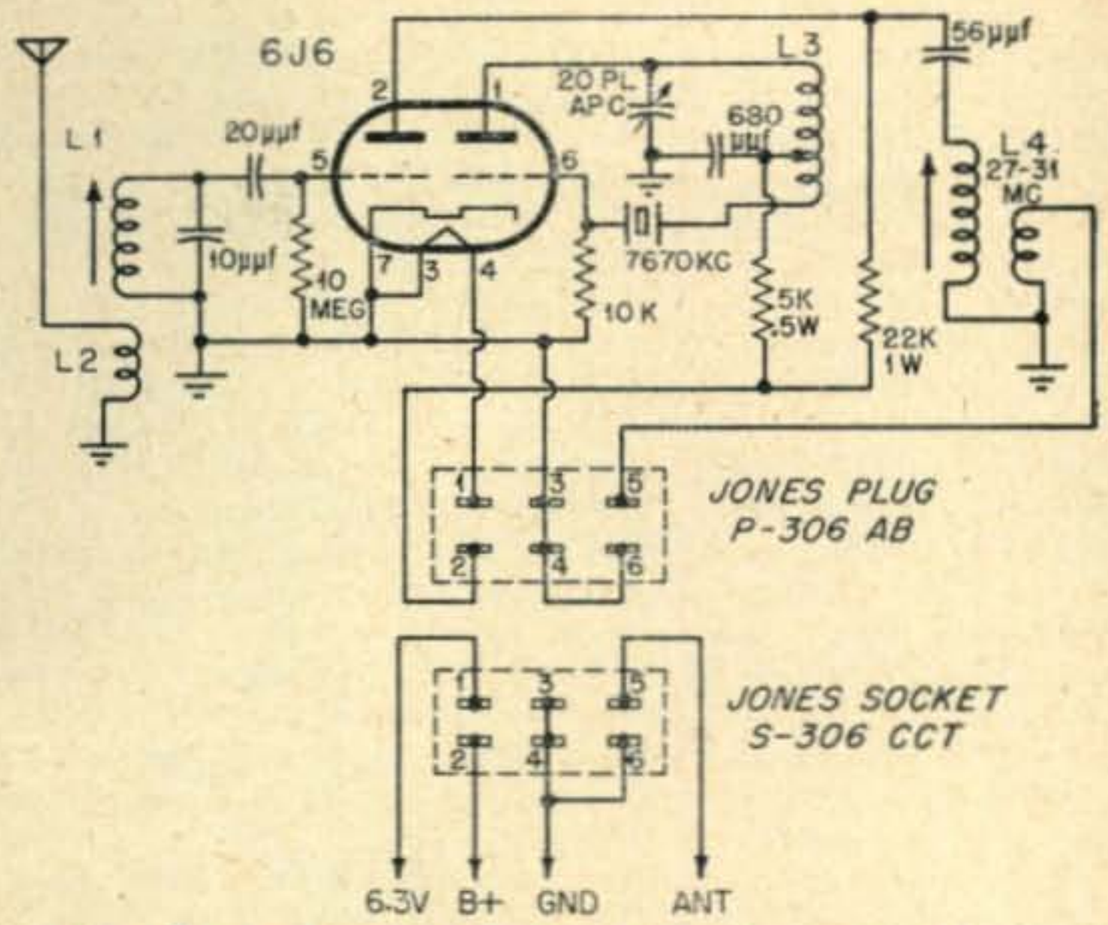
The winner: **VE3BQN!** Had he not been so well known on the band during other contests, his lapse of memory might never have been observed by the gang. But, his 420 mc friends certainly noticed it, hi! Inasmuch as Ted wasn't present, his medallion was worn by two or three others who had perpetrated somewhat lesser "foul deeds." Enscribed on the medallion is the following, by VE3ANY:

"Other years, 3BQN
Was really in there pitching,
Piling up his contest score
His laurels much enriching,
The silence from his noble shack
This time was cause for wonder,
He'd shuffled off to Buffalo—
Oh, what an awful blunder!"

In and Around Chicago

W9CT and Mrs. Hotz were hosts on February 21 at a **STAPERMO** Contest (Stations Per Month . . . worked—VHF Ed.) dinner given for **W9NW, W9JGA, W9KCW, W9PEN,** and **W9KJU,** top contestants in the activity promotion sponsored in the Chicago area by Walter Hotz, W9CT. The menu for the very luscious dinner was

The STAPERMO dinner principals, Ken Caldwell, W9NW, first place; Walter Hotz, W9CT, contest sponsor and James Kastrup, W9JGA, second place.



L1 $6\frac{3}{4}$ T. NO. 30 ENAM. CLOSE WOUND ON MILLEN 69041 FORM.
L2 $1\frac{1}{2}$ T. NO. 30 ENAM. CLOSE WOUND & CLOSE COUPLED TO L1.
L3 $13\frac{1}{2}$ T. NO. 14 ENAM. ON .41 DIA. FORM TAPPED 4T.
L4 TO RESONATE AT 28 MC, LINK TO COUPLE PROPERLY TO 10 METER RECEIVER.

This is the improved version of the W4NDE 6-meter converter. The oscillator section is crystal controlled. The converter is designed for mobile use.

composed by Mrs. Hotz, as was the repast itself:

Martini — Dementia Praecox
Spaghetti Steak — A'la XYL
Corn — TVI
Tossed Salad — Stapermo Dressing
Pickles — Ken - Jim
Apricots — Antenna
Hot Rolls — On Two
Apples — VHF
DX Coffee ——— 9C Tea
73 — Nirip - Sa

The center-piece for the dinner-table was also suggested by Mrs W9CT, who remembered that Walt had a 1922 RCA crystal-set, manufactured by G-E. This de-vice was made in 3 sections which folded, book-like, into a compact package. Mrs. Hotz unfolded it and adorned the sides with fruit to make the most unusual center-piece ever seen by those present . . . After dessert and two more rounds of excellent coffee, W9CT presented the subject of the evening, the award of the W9CT **STAPERMO** trophies to the two Chicago area VHF men who ran up the highest scores for contacts per month from February, 1951, to February, 1952. Ken Caldwell, **W9NW**, "The Dean of Two Meters" in the Chicago area was presented the top award, as was to be expected by any two-meter man in his right mind in the Chicago area. The trophy, shown in the picture, is actually more beautiful than portrayed. The base consists of a block of polished, crystal-clear plastic on the face of which is mounted an engraved plate bearing the call, W9NW. "STAPERMO CONTEST" 1951, and the months which Ken's scores surpassed those of other contestants. On top of the strikingly crystalline plastic block are the call letters, W9NW, made from the same material . . . **W9JGA**, James S. Kastrup, Morton Grove, was presented the second award, another block of crystal-clear, polished plastic bearing a nameplate with Jim's call and winning months of the **STAPERMO** contest.

It is a pleasure to report that Ken, **W9NW**, an old-timer from 1914, received the first award because it is a recognition of his consistent VHF activity, postwar, on the old 2½ meter band and the present 144 mc band since November, 1945. I can think of no VHF man, who knows Ken, that would deny him the honors.

Jim, **W9JGA**, represents the young men of VHF, on the other hand. Lest Jim take a poke at me for implying that he is a "youngster"—which I do not—let me point out that Jim is a Navy veteran from World War II.

He came on Two only last summer, but has been consistently devoted to activity during every available moment with a 5 element beam and 25 watts input to a 2E26 final in an Eldico modified rig. Until recently the receiving situation was fair, but Jim now has a Sylvan crystal-controlled converter which does much better. A new 5-over-5 beam is underway.

The "147.5 FM Party Line Net" is bursting at the seams with activity. New stations: **W9DCN, QDA, BAG, VKV, ACY, FQU, QOW, UX**—all mobiles . . . **W9BX/9** is on temporarily from an Aurora hospital, thanks to W9EQC and WMR who made the installation. **W9PSP, W9LBB** and **W9QGG**, Chicago, joined the group . . . **W9HPJ/9** was installed at State Police headquarters, Harlem and Irving. The groundplane antenna is 345 feet high, and that station is boss when it comes on . . . Mary Lou Witt, **W9KLB-XYL**, turned in an emergency operating job that brought compliments from the whole gang . . . **W9LLX** was hospitalized for a few days for dental surgery: Harry's coming along fine. On Sunday mornings at 10:00 a.m., the net drops the "Party Line" function and becomes the "Medical Communications Net" associated with the medical civil defense group of the Chicago Civil Defense Corps. Net control rotates, with the new control station being notified at the last minute so as to keep the boys on their toes. The entire net, whether controlled or informal, is noted for its high standards of courtesy, consideration and operation. Chicago area hams who are interested in joining the medical communications net training group are invited to write **W9KLB**, Al Witt, chairman of the training program.

W9PK reports that activity is picking up very well and—at times rivals night-time activity! Stations known to be active include **W9s TQ, KQM, LJV, IMQ, DRN, JGA, CX, BVG**, and **WN9OKF**. Varying schedules bring some of them on, one day, and others the next day. **W8MRK**, Muskegon Heights, Mich., and **W9UJM**, Hales Corners, Wisc., were quite active for a while, but haven't been heard for some time. Of this group, W9PK keeps schedules with W9TQ, TQM, JGA and WN9OKF . . . In Milwaukee, **W9TQ** is busy perfecting the VHF RTTY . . . **W9KQM** is busy with TV service work . . . this dope via the 2-meter band . . . **W9DRN**, Des Plaines, Illinois, works a "broken" schedule. You never know who will be on.

W9LJV, Waukesha, Wisc., schedules W9TQ and W9KQM on Monday, Wednesday and Friday afternoons at 12:30 PM CST . . . **WN9OKF** still has troubles with the leg and the cast, but keeps close tabs on his "harem" in the hospital. After the current hospitalization, Leo plans to increase power to 60 watts and also have a rotary beam in place of the TV antenna. **W9CX**, super old-timer—he was an operator in 1904—has had some success in de-TVIing the rig. Bill is another Sylvan converter enthusiast . . . **W9JGA** gets home and on the air at about 3 p.m., in time for a short QSO with W9PK before Jack leaves for the night shift.

W9PK reports a brief Aurora opening on February 10 which produced contacts with **WØQIN, W9VZP, W8CMS** and **WØURQ** on Six Meters. Two meters was monitored very closely, and a crossband contact was attempted with WØQIN, but no aurora signals were heard.

"It's a good thing some kind of an Aurora opening occurred because I had predicted it to **W9BPV** and **W9SUV** the night before on a two meter contact," says W9PK. "Watch reports for March 7th to 10th aurora."

W9PK now uses p.p. 24Gs, 175 watts input, on Two. 420 mc gear is under construction, including a 16-element beam. The converter is about half finished . . . Recent correspondence between **W9HKI** and **W9NFK** revealed one of the darnedest letter-heads ever received at W9NFK. W9HKI, Richard Jorgenson, 1625 S. Main St., Princeton, Illinois. Dick reports that the small shack at W9ZHB, intended as a ham shack for daughter Sharon, is no more as a result of fire. Cause not determined. W9ZHB and W9MBI, Coleta, maintain the nightly 430 mc schedules over the 60 mile path.

Badger Milk Run

W9FAN reports from Sheboygan that the RTTY circuit is now functioning between **W9TQ**, Milwaukee, and **W9DDG**, Sheboygan. **W9LEE**, Westboro, worked into Illinois and Indiana on February 2. Inasmuch as he is 160 miles northwest of Sheboygan, the contacts represented some interesting wintertime DX, about 300 miles. **W9LEE** CQs coutheast nightly at about 2000 CST . . . **W9AFT**, Milwaukee, joined the night-shift group and is active at night only on week-ends . . . **W9BTI** is building a 2-meter mobile rig.

Bob Podewils, Milwaukee, made the grade on the Novice examination and will have the call, soon. He's about ready for the general class ticket, too. Bob is all set up for 80, 40, 11, 10, 6 and 2. He reports W9SOL will be on 2. **W9NVO** traded 2-meter station for 75-meter mobile! Peter Wendt, his wife and 9 year old son all took the Novice examination and all will be on 2 if the tickets arrive . . . **W9FES** plans to be on 2 . . . **W9LCD** is expected on 420 with his TV station . . . **WN9QME** will be on 2 with a Millen rig. About 30 stations get on the 2-meter emergency net on Monday nights, but—2 minutes or so after the net is over—they all go off the air!

Kansas City Notes

WØMNQ says that the central Kansas and southwestern Iowa two-meter gang were heard from in early January, but that local activity has prevailed since then . . . **WØINI**, Pleasant Hill, is quite active, but his neighbors—WØHVW and WØQXT—seem to have forsaken the band . . . After an absence of three years, two-meter mobile signals are active again. **WØDDX, WNØEEU** and a couple of WNØs from Topeka have been heard. More mobiles are expected on, soon. The Kansas City 10-meter mobile net is seriously considering a move to 6 meters . . . Vince Dawson, **WØZJB**, visited the K.C. area, recently, and reports that he is active in Wichita on 6 and 10 meter mobile, only, but hopes to be both 6 and 2 by summertime.

WØATQ (ex-W6WAZ) returned to the band with a rig that has the boys talking. When Vernon was ready to insert an 832 in the new final, he found that it was cracked, so fired up with the 6J6 doubler-driver as a final. It puts out a signal comparable to that from any 522 in town! Other new stations on 2 are: **WØCAX, FGY, ODU, WNØEZM**, and **WNØHBO**, the daughter of WØDRW . . . The 146.8 mc emergency net activity includes **WØLFW, n.c.s., WØDDX, DVV, DRW, DVE, ATM, HOZ, INI, EYO, FPH, WNØFHI, EZM, HBO**, and **EMX**. About eight or ten stations are active each week; so far, none of the mobiles has participated. WØMNQ's "Scoreboard" totals are: 11 states, 5 call areas and 1098 miles DX.

On The East Coast

W2WHJ, Somerville, New Jersey, has been on 2 for about a year and a half and says that his association at work, with W2NLY, certainly maintains his interest. Alex reports an Aurora opening on February 10 produced signals from W8WJC, Everett, Ohio, and W2SFK, Glens Falls, New York, but no contacts other than with W2NLY for W2WHJ's first Auroral QSO. Alex operates on 144.7 mc, c.w. or phone, horizontally polarized "Brownie" (W2PAU) ten element flip-flop beam 25 feet high. The receiver is a Wallman Cascode, crystal controlled, into an HRO-7. The transmitter is a home-built job with an 829B final . . . According to **W2WHJ**, horizontal polarization is gaining favor on the east coast. **W2UK, W2AZL, W2NLY**, and **W2WHJ** are looking to the west for contacts on horizontal. They listen for c.w., too. The present VHF Scoreboard standing for W2WHJ is 8 states and 3 call areas.

VHF s.w.l. Bob Flanzraich, Brooklyn, New York, expects his license, soon, but lives only a block away from WN2 IEJ who operates on 2. Bob feels that WN2IEJ is well qualified for the **F.F.O.T.** certificate by virtue of his consistent operation, fixed and mobile, and his friendly spirit.

WN2KLH, Ken Lindberg, Jamestown, New York, reports activity "lower than S-1" in his area. "Too many listeners and not enough talkers," Ken says . . . **W2TVC** now has a 5-over-5 beam atop his 65-foot stick . . . **WN2KLH** has frequent schedules with W3QKI and W3WBM, Erie, Pennsylvania, about 70 miles distant, using an Eldico mobile unit and a 3-over-3. Ken has good results, mobile, too, using a dipole. He has worked 200 miles while in motion. W2TVC has a 5-element array on his car and works DX regularly . . . **W2UFZ** works out well with a Gon-Set converter, a TV antenna and

(Continued on page 68)

Conducted by LOUISA B. SANDO, W5RZJ*

Some more good publicity for ham radio in general and the YLs in particular. Our thanks to WN1UWU for a clipping from *The Bridgeport Sunday Post* (Conn.) containing an FB photo of W1NJJ and write-up about Eunice and a number of other YLs. Eunice's OM is JA7SL, in charge of communications on several Japanese islands, and it's a happy day when conditions are right for a personal QSO with W1NJJ. Incidentally, Eunice's daughter Aline, a University of Connecticut co-ed, is W1SRJ.

Another good plug for the YLs appeared in the *Chicago Herald-American* which carried an FB photo of W9GME, Grace, at her rig along with photos of the rescue of Capt. Kurt Carlsen from his ill-fated *Flying Enterprise*. Grace had QSO'd W2ZXM several times — as had W1NJJ, W1MCW, W8DQO, and other YLs.

YL Meetings Planned

A get-together for New England YLs is scheduled for April 19, 1952, at 1:00 p.m. in the Lafayette House, Foxboro, Mass. All YLs are cordially invited. For tickets and further details write Peg Wells, W1BCU.

The W9 YLs will have a get-together on May 23-24-25, 1952. Plans call for arrival in Chicago on the 23rd and checking in at the Hotel President, 2054 N. Lincoln Ave., Chicago, Ill., the QTH of W9GME, Grace, who has been selected chairman of the gathering. There will be a $1 registration fee which should be mailed to W9GME in advance to give an idea of how many girls plan to attend and also so she can make room reservations. On the 24th the girls will gather for dinner at 7 p.m. at Math Igler's restaurant. The Hotel President is centrally located, close to Lake Michigan and the Lincoln Park Zoo and only twenty blocks from the downtown shopping area with bus service from the front door. The Chicago girls invite any and all YLs who wish to attend, and ask that reservations be made early.

**Address all correspondence to 959C-24th St., Los Alamos, New Mexico*

Club News

The New York City YLRL held its sixth annual installation of officers luncheon on Saturday, Jan. 19th, at the Red Coach Grill on East 58th St. These new officers were installed: president, W2EEO, Madeline Greenberg; vice president, WN2IGA, Ruth Kalish; secretary, W2RAQ, Catherine McFadden; treasurer, Helen Zuparn (no call). These YLs helped celebrate the occasion: W2OWL, Ruth; W2QWL, Mignon; W2QGK, Sophie; W2PZA, Jean; W2OVV, Mina; W2PUY, Selma; W2JZX, Vi; W2MEG, Willy; W2IQP, Lil; W2UXM, Sallie, and Jean Merton, Eva Hudson, Ruth Schlitt, Mae Gallop and Hazel DuBarton. "The best yet," says W2OWL.

The Chicago YLs are very happy to announce that on Jan. 24th they organized the first YL Club in

New York City installation-of-officers luncheon, Jan. 1952. First Row: W2OVV, W2GQG, WN2IGA, Helen zuparn, W2EEO, W2QWL, W2RAQ. Second Row: W2UXM, Jean Merten, W2JZX, Mae Gallup, W2PUY, Eva Hudson, W2MEG, W2OWI. Top Row: Hazel DuBarton, W2IQP, W2PZA, Ruth Schlitt.

Chicago. The meeting was held at the QTH of Helen, W9FZO. Monthly meetings will be held at the ham-shack of one or another of the YLs. Any interested YLs are invted to get in touch with W9GME, Grace, and she will put you on their mailing list. They are also conducting their 10-meter net every Tuesday evening at 10 p.m. CST around 29 mc. Every YL is invited to join in if possible.

Last month we announced the *LAD 'N LASSIE* certificate being offered by the YL Radio Club of Los Angeles to anyone who can show proof of contact with twenty members of the club. Here are the calls of two more club members to listen for: W6MFP and W6FEA.

February 9th was the occasion of a joint meeting of the San Diego and Los Angeles YLRL Clubs, with the San Diego group playing host. The Los Angeles YLs descended upon them by car, train and plane and it kept W6MWU, Mary, and W6YXI, Neva, busy most of the day greeting and chaufeuring the gals around. The meeting and luncheon were held at beautiful Balboa Park. Representing the Los Angeles club were: W6AVF, CEE, FEA, GKJ, MFP, NLM, NZP, PJU and guest, IKI, UHA and guest, WRT, YZU, and VE3DTW. From San Diego: W6AWW, BLF, IGP, JKE, MWU, YXI, YYM, ZYD and her mother and friend, and Connie Liljegren and Jeanette Merrill (no license yet). W6JKE, Ruth, president of the San Diego club, was mistress of ceremonies. CEE and FEA said a few words and then VE3DTW, Ethel, gave a talk on her trip to Europe two years ago, telling of meeting the Gs and a PAØ YL she had worked on the air.

Net Change

One change in the YL nets. The 75-meter net now meets at 3 p.m. PST Mondays on 3900 kc. with W7HHH as NCS.

Here and There

Another really "jr." YL has entered our ham ranks. Arlene Beard, of Scottsdale, Ariz., received her call WN7PXU last October at the age of nine. She is the daughter of W6PEB/7, Melba, and W7QGR. On the air with her is her brother Wayne, WN7QLN, aged 12. This makes it another 100% licensed amateur family, and, with half of the operators feminine they say they find CQ — and this column — a must. Tnx!

Letters from two YLs who are just joining YLRL, and both claim: "I was the first YL in Indianapolis to get a ticket"! W9IES, Nelda, and her OM were exposed to the ham bug at about the same time and Nelda expressed an interest in getting her ticket. She happened to make the remark in front of an XYL who didn't take so kindly to ham radio and the remark met with, "Well, if you do, you will be the first YL in this town." Says Nelda, that's all it took — plus a little time. She got her ticket in August, 1949, but with the arrival of two jr. YLs since then her QSOs are mostly with locals after the young 'uns have been tucked in.

Guess W9RTH/Ø, Adah, wins as "first Indianapolis YL", however, for she's been licensed since 1941. Temporarily in Minnesota, she expects to be back in Indiana by fall. She's ECO on 20 CW now and hopes to be on 20 phone soon for she's been Class A since a year after she took her first exam.

W5FPB has just completed the roster of Albuquerque, N.M., area hams and, since we reported on them a year ago, the YL population has grown considerably. Albuqerque now boasts seven licensed YLs, five of them being husband-wife teams. They

Maria, IS1EHM

are: W5PKL, Billie (OM W5NSN); WN5UDB, Charlotte; W5IGO, Thelma; W5TLI, Frances (OM W5WRS); W5SYZ, Betty June (OM W5PHO); WN5UCV, Lillian (OM W5PQA), and W5RQK, Lillie (OM W5RFF). Nice country, nice climate — why don't some more of you come out? Hi!

Learning Code

The XYL of W9FAN wants to know if there's an easy way to learn the code, having tried to learn it but to no avail. How we wish we could say, yes, there *is* an easy way! But it just isn't so. Code is the stumbling block for many a would-be ham (OM as well as XYL), and there's no way around it. You've just got to memorize it, sound by sound for each letter, and above all practice, practice, practice! Think code, live code—every newspaper or magazine you pick up start saying to yourself the letters and numbers in code. If you're out riding with your OM, or on a bus, every street sign or billboard you see, spell out the words in code. Sooner or later it will have to register and then you can start building up speed by listening to tape recordings or over-the-air transmissions.

YL of the Month

Our YL of the Month is a girl we heard about from W6UHA, Maxine, who has enjoyed pleasant QSOs with her. The YL is IS1EHM, Maria Marras of Sardinia, and a note of inquiry brought a charming letter in reply.

Maria had been exposed to ham radio for some time for her brother has been licensed as IS1EH for six years. She liked to listen in on his QSOs but never went near the mike herself. Then came the day when John left for Italy to complete his studies. Their parents, anxious to talk with John, urged Maria to learn to operate his home station for he was taking along a 10-watt portable. To please them she did learn to handle the rig and a bit about the mysteries of electricity, as well.

"I'll never forget the panic which seized me during the first contact," says Maria. "I was just muttering; and for a long time IS1EH was my only QSO and DX — hi! But now I keep on transmitting although my brother is again here in Sardinia. I like the QSOs because they give me the possibility to form

(Continued on page 60)

IPOIO

LISCUM DIVEN, W7PGX*

Most of us are reasonably familiar with the basic principles of radio theory and the application thereof. Vacuum tubes and electronic circuits behave according to natural physical laws, knowledge of which may be acquired from any good textbook. However, as we all know, puzzling problems frequently arise, and in attempts to find the solution to these problems, one important natural law is almost invariably overlooked. This is the law of *IPOIO*, which, if thoroughly understood, will help to explain many previously baffling phenomena, and when put to proper use, may at times be a powerful tool, as valuable, if not more so, than mathematics, physics or the screwdriver.

Through the ages, scientific brains have worked at discovering, formulating and applying the basic physical laws, and it seems incredible to this writer that *IPOIO* has been completely overlooked by so many so-called experts in the radio field. In fact, its existence has only been hinted at in a few now out of print references.[1],[2].

IPOIO, for the uninitiated, is simply the *Innate Perversity of Inanimate Objects*. The reader need only reflect for a moment to realize that inanimate objects *are* innately perverse—that they quite frequently have minds of their own, which at all times are endeavoring to confuse us and make our path in life more difficult.

Let us take a few simple examples, familiar to everyone: Toast always falls on the floor buttered side down. It doesn't rain when you carry an umbrella. The telephone always rings when you are in the bath tub. The reader may call these phenomena just coincidences. Ha! Any engineer can tell you that electrical phenomena are the results of *definite causes*. The same is true of all other phenomena, even if the cause is not immediately obvious.

The foregoing examples are only general illustrations of the basic law of *IPOIO*. Let us now concentrate on the functioning of *IPOIO* in the field of amateur radio, and use a somewhat more complex example.

You have a sked with your pal Wilberforce in East Overshoe, Maine. This sked has been maintained regularly, without fail, for the past three years. One day your Uncle Oscar gets wind of this and suddenly recalls that he has an old college chum in East Overshoe, and would it be too much trouble if you could arrange for them to talk together? Not at all, you say. You are only too eager to cooperate, being full of ham spirit (plus the fact that Uncle Oscar is well fixed and getting on in years). The appointed day arrives. There is the worst ionospheric storm in history and nothing can be heard on the band except one guy with a mobile rig parked right outside the house. Uncle Oscar goes off muttering in his beard how he never believed in all this tomfoolery of yours anyway and what did you think he was, telling him that you could talk to stations all over the world and here you can't even get East Overshoe.

Next day, of course, conditions are normal.

We will next consider another example familiar to all.

After fourteen years of patiently combing the band, AC4YN appears. You hear him on his first CQ and, trembling, you give him a call. With bated breath, you hear the answer "QRZ? W7P?? K" Trying to be calm, you press the key. And here *IPOIO* enters the picture. For no known reason, a fuse blows. (Subsequent investigation will show that there is nothing wrong with the rig.) BUT—having been on the air for many years, you have grown to expect something like this and a box of fuses has been kept permanently on the table directly behind you. Without the turning of a hair (except to gray), you reach for the fuses and discover they are no longer there. After it is too late you find them on the floor behind the table. How did they get there? *IPOIO!*

These are not isolated cases, as one remembers that invariably during DX contests there is either a complete fade out or a severe ice storm, or both, which affects thousands of hams. That such things always happen at the worst of all possible times can only be attributed to *IPOIO*.

". . . never did believe in all this tomfoolery . . ."

Is it possible that the reader by now is not convinced of the real presence of *IPOIO?* Then let him consider this:

What happened the last time you decided to rebuild and make the rig completely TVI-proof? When the final was scattered all over the room, the phone rang and your pal Joe on the other side of town told you to hurry up and get on the air because he had FG7XA lined up for you and to get

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1 "On the Mathematical Probability of Throwing 27 Consecutive Double Sixes", True Suicide Stories, April 1913

2 "How to Beat the Stock Market", Omnidigest, October 1929

*6814 North 11th St., Phoenix, Ariz.

a move on because the DX was closing down in ten minutes.

The reader may now say this is all very true and unfortunate, but nothing can be done about it. Not so! If you are willing to make a few relatively minor compromises with *IPOIO*, *IPOIO* can be made to work for you. By application of three simple rules, you can take advantage of *IPOIO*. Of course, perfection is not guaranteed, but a little practice will produce surprising results. The basic principle is to ride with the tide and not try to fight it.

The following rules should be thoroughly memorized:

1. Always endeavor to make things as inconvenient for yourself as possible.
2. Assume that in whatever you are trying to do the results will be exactly the opposite of what you expect.
3. The solution to any problem will be the one you wish it wasn't.

Let us see how these rules may be applied to amateur radio.

I. Working DX

Problem: *Everyone has been working FR7ZA, but try as you may you can never seem to get on at the right time. How can you arrange conditions so that you can get a crack at him?*

Solution A: Apply Rule 1. Invite the boss to dinner. Buy the biggest, thickest steak you can find —money no object. The boss arrives on time and the steak is done to perfection, ready to serve. Just at this point, excuse yourself on the pretext of washing your hands. Sneak down to the shack. Take a quick look for FR7ZA.

He'll be there.

Solution B: A similar approach. Buy tickets for so that by the time you dress you have only ten minutes to make the theatre. Just as you are leaving, turn the receiver on for a second.

He'll be there.

II. Making DXCC

Problem: *How can you extract QSLs?*

Solution A: Rule 2 may be applied as follows. If you have worked several stations in the desired country, let us say four. On the first three, give the full treatment—air mail, reply coupons, home made QSLs and call books. According to Rule 2, no results will be forthcoming. On the fourth QSO do *not* apply the full treatment. Do not even send him a card. If you have the nerve, during the contact tell him that you are not interested in DXCC, you have no QSLs, and please don't send one, and if he does you will only throw it away. Card from Number four will arrive in three days.

Solution B: If you have only worked one station in the country, the approach would be more like this: Send him a card in the ordinary way. Casually remark that you would like his card. After the first two years have gone by give up and decide that a more radical approach is needed. Send him a ten-year subscription to *CQ*. Take your only two spare 813's, put them in a box and mail them to him.

When you return from the post office, you find his card was in the last mail delivery—you hadn't seen it laying on the hall table.

III. Winning Contests

At this point it must be remembered that *IPOIO* is not only directed against you, but against everyone.

Problem: *Year after year, you have never bothered to enter the DX Contest because W7XYZ, a rabid DX man, gets out better than you do, and there is no point in trying to compete against him. Of course you have found out after each contest that he didn't bother to go into it either because he was afraid of you (notice that IPOIO is affecting both of you). What can you do about it?*

Solution: Be patient. One year he will decide that he is definitely going to enter because you don't intend to. Now is your chance. Because of *IPOIO* this, above all times, is the time for you to go in with both feet, because he will probably break a leg.

(Of course, *you* might, too).

IV. Servicing

Problem: *You turn on the receiver and smoke comes out.*

Solution A: Apply Rule 3. The smell tells you that it is a carbon resistor—but which one? (It could be found out by normal servicing means, of course, but by use of *IPOIO* the trouble may be located without instruments.) Look at the schematic and the parts layout. Find the can which has the greatest number of leads to be unsoldered. Remove this can and all the parts inside it. The last resistor you take out will be the one you are looking for.

Solution B: Rule 3 again. Take the receiver parts list and call all local suppliers. Find out if replacements are available. You will find one component which no one has and which cannot be obtained for at least eight months. That's it.

V. Designing and Constructing Equipment

Problem 1: *To construct an antenna that will not stretch.*

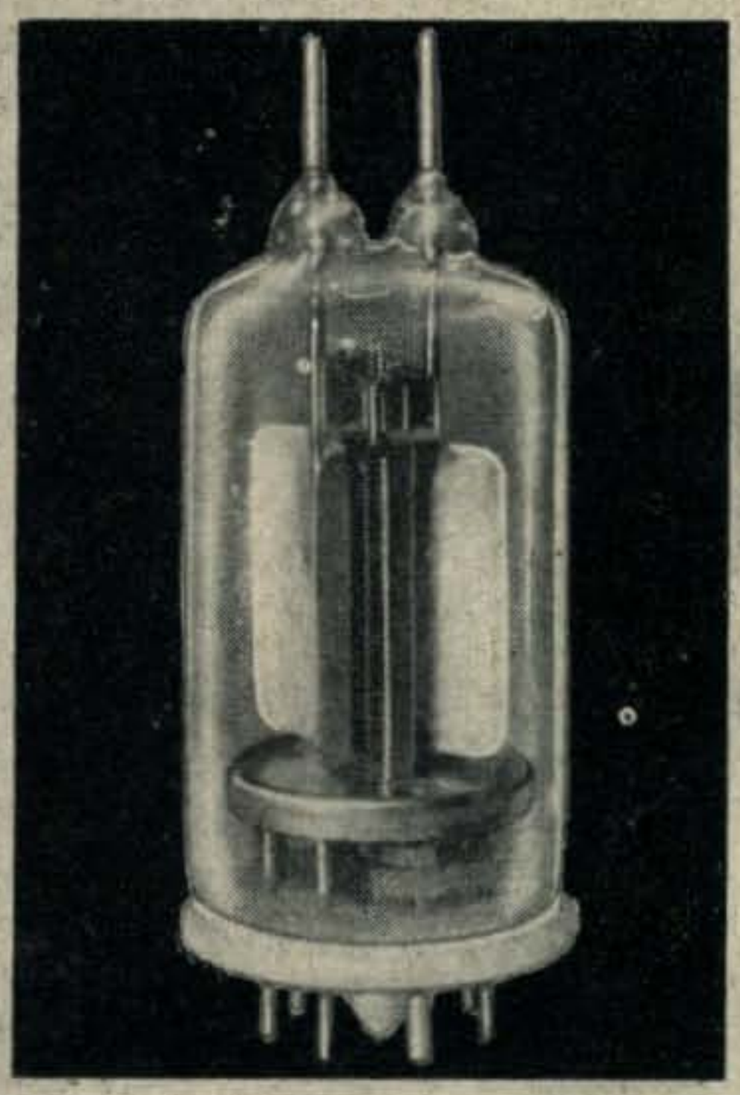
Solution: (By now this ought to be a cinch) Cut the antenna about two feet too short, to allow for stretching. It is guaranteed not to stretch.

Problem 2: (This is an important application of Rule 2) *To design a feedback amplifier which will not oscillate.*

(Continued on page 60)

". . . allow for stretching. It is guaranteed not to stretch."

PUSH-PULL POWER with REDUCED CAPACITANCES



250 mc. 85 watts output

300 mc. 70 watts output

450 mc. 32 watts output

New! AMPEREX 5894/AX-9903

UHF and VHF Twin Tetrode for W-I-D-E Band Operation

RF Amplifier, Modulator, Frequency Doubler, Tripler

5894/AX-9903 CHARACTERISTICS

Filament Voltage

Series	12.6v.
Parallel	6.3v.

Filament Current

Series	0.9a.
Parallel	1.8a.

Maximum

d.c. Plate Voltage	600
d.c. Grid #2 Voltage	250
d.c. Grid #1 Voltage	−175
Plate Dissipation (w.)	2 x 20
d.c. Plate Current (ma.)	2 x 100

COMPARE CAPACITANCES of this tube with its nearest equivalent type.

	PER UNIT	PER UNIT
Grid to Plate	<0.08 mmfd.	<0.12 mmfd.
Input	10.5 mmfd.	14.5 mmfd.
Output	3.2 mmfd.	7.0 mmfd.

MOUNTING POSITION: Base up or down. Horizontal with anode leads in horizontal plane.

Fits 829B Type Socket.

● The AMPEREX 5894/AX-9903 is an improved version of the 829B. The design of this tube incorporates features which produce considerably smaller output capacitances and which, therefore, result in higher resonant frequencies (approximately 500mc. instead of 250mc.). In addition, because of the low inductances of the connections between the cathode and screen-grid, more stable operation of high frequencies is effected.

● A most desirable design characteristic, also, is the incorporation of internal neutralizing condensers which are connected directly to the control-grids, making impossible self-oscillation in a tuned-plate, tuned-grid transmitter.

● Of importance in this new design are such features as:

1. Direct and short connection between the pins and the anode, causing lower inductance and resistance.
2. No insulating parts (mica or ceramics) between anodes, causing losses at high frequencies.
3. "Screened" micas, thereby preventing possible losses due to contaminated mica.
4. Zirconium-coated moly anodes, giving a higher degree of vacuum than possible with nickel anodes and barium getters.

● For full data on the AMPEREX 5894/9903 AX- see your local radio distributor.

● IMMEDIATE DELIVERY Order from your local radio distributor.

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Road to Zanzibar

(with apologies)

R. F. B. FEATHERSTONE, VQ4RF*

This story really begins in March, 1951, when W5HBM, Morgan Richards, of Dripping Springs Ranch, Texas, told me on 28 mc that he was going to Europe and would return to the States via Africa. It didn't take long to make arrangements for he and his XYL to visit VQ4RF.

Some seven months later, they stepped on my verandah in Nakuru. Difficulties with their Jaguar motor car had delayed them; so they had only a limited time before they had to return to Mombasa to rejoin their ship en route to Beira in CR7. About two hours before their departure, the possibility of a DX expedition to Zanzibar was mooted and details settled. Morgan would furnish the capital, and I would be the expedition manager. We would meet later in Zanzibar.

Our Destination

The Island of Zanzibar lies about twenty-five miles off the East African coast, slightly north of Dar-es-Salaam (The Haven of Peace), and is about twenty-three by fifty-four miles in size. Ruled by the Sultan, His Highness Sir Seyyid Khalifa bin Harub, K. C., M. G., K. B. E., and formerly a slave port, it is now noted for its exports of cloves and copra. The pamphlet from which I obtained this information added "Zanzibar has electric light, which is 230 volts, d.c."

That complicated things. In a hot, humid climate, you are bound to have fans, and when you have them running from d.c., you might as well pack up as far as radio reception is concerned. Well, we would have to operate well outside of town, and I had to find a generator as well as a transmitter and a receiver.

I made a trip into Nairobi. The fellows offered what they had, but there was little suitable for the purpose, until Robbie, VQ4ERR, mentioned that Doc Allen, W6EXT/VQ4CO, who had recently arrived in Nairobi, had a 75A1 and a 32V1. So along to Doc to "pop the question." And, believe me, that's exactly how it felt. With very little hesitation, he generously agreed to lend them to us along with a kilowatt and a half generator manufactured by the Jackson Engineering Company.

W1MB, W9EWB, and W5EFC and a group of other W5's solved the spare tube problem for us, and we deeply appreciate their efforts.

Morgan left the ship at Beira, and I talked to him over ZE1JE. He would arrive in Zanzibar on November 22, and I would arrive on the twenty-fourth.

Dunc, VQ4GDF, had finished some unique carrying cases and I was getting the last of my bits of gear together when we heard that Pat had become ill and was flying back to the States. As a consequence, Morgan would not arrive in Zanzibar until December 1, setting back my arrival to the 3rd. This made little difference, except that we were sorry for Pat's sake.

Counterbalancing the bad news was some good. Doc decided to come along, which would help me a great deal with the 75A1 and 32V1, as I was not going to trust anyone except ourselves to handle them. Also Ian, ZS6TC, would drive with Morgan in the Jaguar across Africa to Dar-es-Salaam, leaving Johannesburg, Sunday, November 25, immediately after Pat's plane left.

Doc and I rolled out of Nairobi on the *Mombasa Mail*, Sunday, December 1, with VQ4GDF waving goodby. We arrived in Mombasa on Monday, three hours late, because of a derailment, and were met by Don, VQ4BY, and John, VQ4ZFW. The generator packing case looked rather the worse for wear; so John had it moved to his shops for inspection and recrating before putting it on the ship.

". . . a palace by the edge of the sea. . ."

Leaving Mombasa on the *SS Mombasa* that evening, we arrived in Zanzibar, via Tanga, at 1700 hours, December 2, with no Ian and Morgan to meet us at the quay. The generator could not be removed from the hold until the next morning, and Customs would process our radio equipment only as a whole; so we left the Collins equipment in their charge and set out for the hotel.

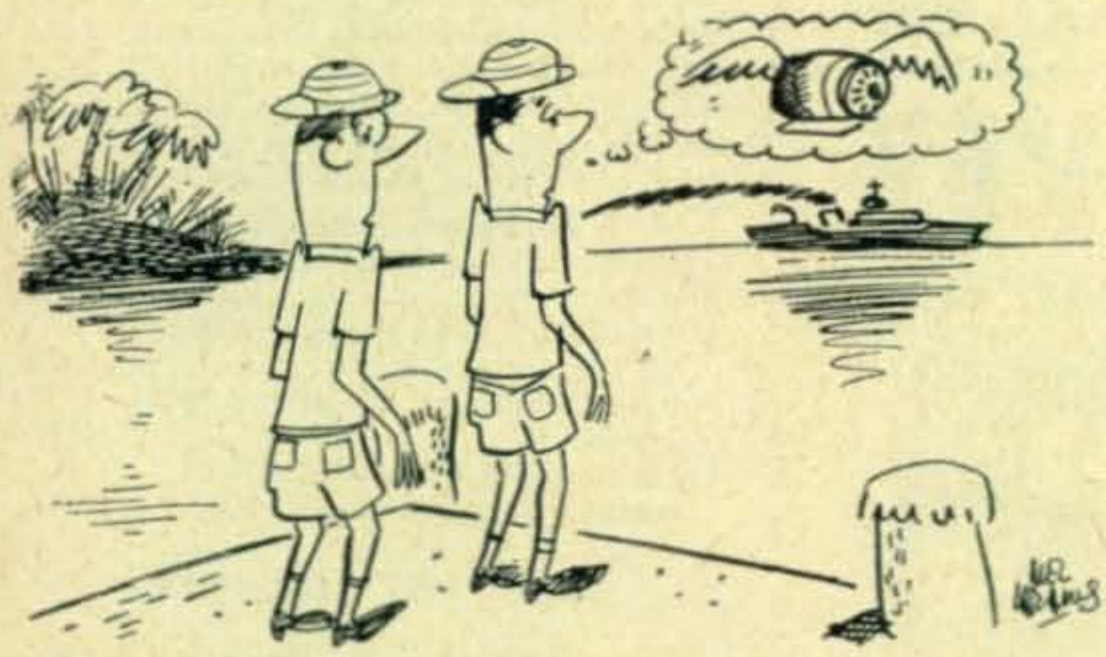
Early the next morning, we made arrangements to get our equipment on and off the island without paying duty and called on Messrs. Cables and Wireless. They extended us every courtesy, then and

*Box 264 Nakuru, Kenya Colony, East Africa

throughout our entire stay, even to driving us out to Chukwani, a government rest house, on the seashore, seven miles from the city, and making arrangements with the government for us to use it.

I wonder if any other radio station has ever operated from such ideal surroundings: a palace on the edge of the sea, with a private beach, and surrounded by coconut palms, whose nuts were nicely ripe for eating.

Doc and I were just leaving the hotel after lunch for the docks when Morgan and Ian arrived, having left the automobile at Iringa, Tanganyika, and flown the rest of the way.



"... the MOMBASA was gone with our generator..."

Trouble

When we arrived at the docks, the *Mombasa* was gone, with our generator still in its hold! The officials promised to have it back from Dar in the morning; so we sent a telegram and waited for morning. Still no generator, and no reply to our telegram. We dispatched three more to Dar, Tanga, and Mombasa, because now we were not sure where the generator was. Also, Ivan, VQ4IMS, a radio officer for East African Airways, whom we had met the evening before, was looking for it in Dar. However, another morning dawned with no trace of the generator, and no answer to any of our telegrams!

We got on the radiophone to Peter, VQ3PBD, in Dar, and a little later, got a wire from him saying the generator would arrive on the afternoon plane. It didn't! Neither Morgan nor I were quite sane on the subject of generators by this time, and we jumped at a chance to go over to Dar on an ivory boat to see for ourselves, arriving at 0530. We immediately started looking for Peter, picking up VQ4IMS on the way.

After Peter's wife fed us, we went out to the airport, and there was our generator! Our intention had been to bring it back on the ivory boat guarding it personally every inch of the way. We were assured that it would leave on the noon plane; therefore, uttering dire threats of what would happen if it didn't, we chartered a plane to get back to Zanzibar ourselves (all regular accommodations being gone,) arriving just a half hour ahead of the generator.

Our troubles were over—well, almost. The lorry carrying genny out to Chukwani broke down three times, but once arrived, the generator worked perfectly. In fact, all the equipment did. The 85 degree temperature and 84 per cent humidity didn't even phase the *Astatic* D-104 crystal microphone!

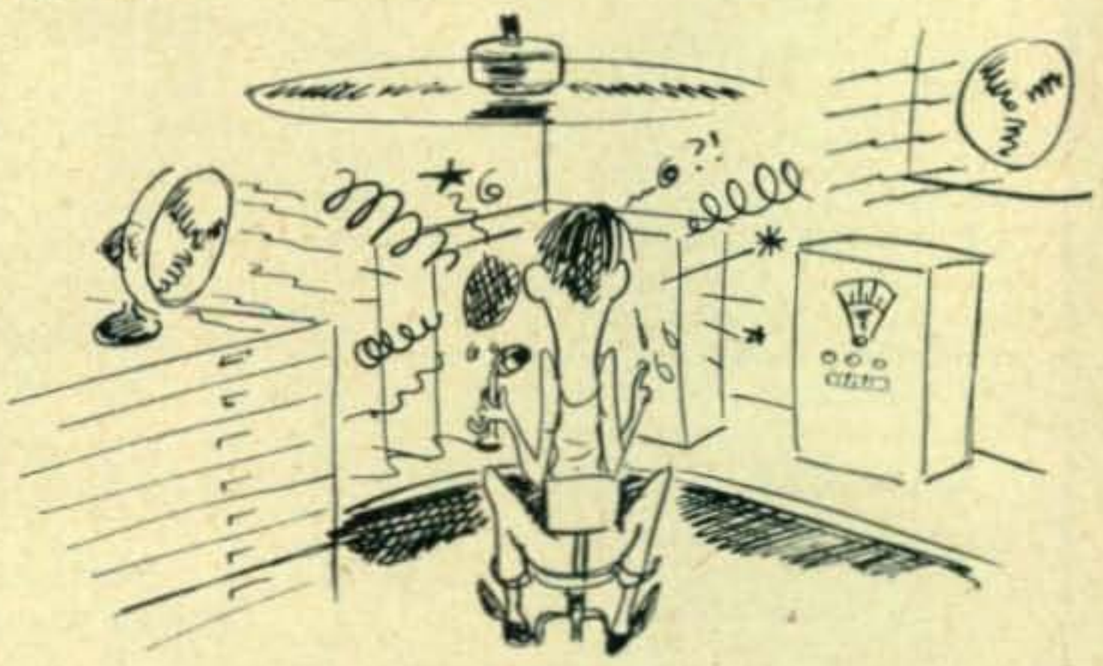
Getting on the Air

Although we had been on the island for five days, we had been able to do little about an antenna. I wanted to put up two V beams, but we had no poles and no way to put them up if we had. Messrs. Cables and Wireless got us two forty-five foot poles and offered us their labour gang for Sunday. Temporarily, we strung up a 270 foot wire, running approximately NNE-SSW, between the palace and an old ruin. Vegetation was so heavy that we had to cut a path through it with a *panga* (machete).

Peter had promised to listen for us every fifteen minutes, starting at 1730. It was 1815 when we got the antenna up, and there was VQ3PBD calling us at the low end of 7 mc. We made contact at 1520 GMT, December 8, 1951, exchanging S9-plus reports.

After signing with VQ3PBD, we tried three calls on 28 mc, without results, so we put the receiver on 14 mc, to hear G2DPZ calling us! I wish I had a photograph of our faces at that moment. The same thought was passing through our minds: *Gosh, if we are tuned up on 28 mc and are strong enough on 14 mc to be heard in G, we've probably blotted out Cables and Wireless and put the broadcast station off the air, and the police will be here any moment.*

In dead silence, Morgan switched over to 14 mc and handed me the mike. We all held our breaths as Morgan put it over. There was John's carrier, the sound of something falling off the table over there in G, and finally John's voice: "Good evening, Frank. Boy! Am I excited! I just walked into the shack and decided to give you a call on spec...." That word *spec* (or in the "blind") was like a reprieve.



"... you are bound to have fans ... might as well pack up as far as reception is concerned."

As we signed with John, the band broke into bedlam. Wherever we tuned, we heard "VQ1RF." We worked a bunch of ZS's first, for their signal overrode everything, then some more Europeans and some North Africans. Repeated requests not to call us on our own frequency and a refusal to answer those who did had its effect, and we had practically a clear channel.

(Continued on page 60)

NOVICE SHACK

(from page 47)

The other is a series of extremely compact (4" X 4½" X 6") single-band c.w. transmitters. They use either three 6V6GT or 6AQ5 tubes, and are obtainable for any amateur frequency up to 30 mc, and sell for $28.55 with tubes. Key, crystal, power supply, and antenna tuner (if needed) are extra. Power input depends on available voltage, and it is approximately 30 watts with 500 volts.

Letters

Mail the past month covered a wide range of subjects. Excerpts from some of the more interesting ones follow.

Captain Dick France, of the Air Force, has been interested in amateur radio since talking to his home from a Post ham station several times, but his jumping around has prevented him from doing any serious studying for the license yet. His experiences learning the code are unusual. ". . . . I don't know if my experience could be considered average, but it might have been the first time anyone ever used a 'Philkoda' (see last month's *Novice Shack*) to memorize the code in an aeroplane flying at 10,000 feet on full instruments. Under the circumstances, it took about two and a half hours. Since then, I have been able to do nothing else about it, but I can still write out the alphabet."

You may recall WN8HWL's letter of a few months ago about phone interference and my suggestion that most of it was from VE phones. As a result, VE2IZ wrote what might be called the Canadian reaction. Space does not permit printing his entire letter, but the following excerpt should make it doubly clear that interference is usually a double-edged weapon.

". . . . Why blame the Canadian phones for interfering with the Novices, when it is the opposite that is happening, making 25 kc of our band useless? . . . I am not blaming the Novices, but the F.C.C. for poor thinking. . . . I would suggest that all thinking W's and WN amateurs write and petition the F.C.C. to move the novice band to 3550-3650 kc, where they would not be interfered with and VICE VERSA": VE2IZ.

The cartoon QSL card of Tom, W5RLL and his XYL, Betty, W5UKZ, contained the following terse message: "This is what happens to OM's who teach their XYL's the code at five w.p.m. and help them get novice tickets. W5UKZ is ex-WNØFBW. Oh well, I can always go mobile on ten—I hope": Tom

WN5TOM, Louis, has been licensed for five months and has worked twenty-six states, twenty-three confirmed, not bad for a thirteen-year old lad running eleven watts input. He suggests that a *Question Box* be made a regular part of the *Novice Shack*, and he would like to see two or three pictures of Novice stations in each issue. So would I, and if usable pictures are sent to me, I will certainly print them.

(Continued on page 58)

WE'RE ON OUR TOES TO SERVE YOU BETTER, QUICKER, MORE EFFICIENTLY!

Fellows — you'll be glad to know that after months of planning, we've now completed the installation of enlarged, streamlined offices, new inventory controls, automatic bookkeeping machines, electric typewriters, and expanded warehouse facilities. This means faster and more efficient service from WRL — one of The World's Largest Distributors Of Amateur Radio Transmitting Equipment. Our new facilities enable us to offer you the most personalized service anywhere. WE FINANCE OUR OWN PAPER, MAKING IT CHEAPER FOR YOU TO BUY FROM US. Our large volume of sales means — More Liberal Trade-Ins, Lower Down Payments, and Faster Service. Special attention given to foreign orders through our special Export-Import Office — cable address WRL1.

Leo I. Meyerson, WØGFQ

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Built-in power supply on separate chassis. Front panel oscillator compensation control. 20 to 1 precision gear drive. Provisions for NBFM adapter. Push-pull audio output. Speaker matching transformer built into receiver with 8 and 500/600 ohm output terminals.

$383.50
(less speaker)
LOW DOWN PAYMENT

10" PM Speaker matching cabinet **$16.00**

NEW ELMAC-A54
Under-dash Mobile Xmtr.

VFO or Crystal control. Direct-reading. VFO on all bands—75, 20, 11, 10. • Plate modulation • Completely band-switching, fone or CW. • 50 Watts max. input. Power required: 300-500 V.D.C. at 250 ma., 6.3 V AC or DC at 4.5A. • Uses 3-6AG5, 6AR5, 6C4, 12AU7, 2-6L6G, 807, (included). • Only 7½" x 7½" x 12", 14½ lbs.

For carbon mike input **$139.00**
For dynamic or crystal mike **$149.00**
Power Supply, 110 Volt AC **$ 39.50**

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Covers 560 kcs to 35 mc in 4 bands. Voice or CW. National Select-O-Ject built-in. Includes AVC, automatic noise limiter, antenna trimmer, variable CW pitch control, separate R. F. and audio gain controls, jack for phone or NFM-73B adapter, volt rg, stabilized oscillator.

$149.50
LOW DOWN PAYMENT
(MATCHING SPEAKER) $11.00

RADIO REFERENCE MAP

25c
HANDY WALL SIZE

NATIONAL RECEIVERS

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NC-183 (WITH MATCHING SPEAKER)	$295.00
SW-54	$ 49.95

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- ☐ Select-O-Jet Info
- ☐ HRO-50-1 Info
- ☐ ELMAC-A54 Info
- ☐ NC-183 Info
- ☐ NC-125 Info
- ☐ Used Equipment List

C-4

Name_____

Address_____

City_____ State_____

As for a *Question Box;* this is also an excellent suggestion for questions of general interest. Most of the many received to date have been of the type best answered by letter; therefore they have not been published. These two from WN2HMR, Ira, however, will probably interest many readers.

"Herb, What is your opinion of Novices using bugs before they obtain their General Class licenses? I plan to operate on two-meter c.w. after I get my General-Class license. Most of the Novices I know who are interested in two meters plan to use phone. How can I be sure of finding anyone on c.w. to work?"

Answers: I have found that if a ham gets an urge to use a bug, he will do it, even if you advise him not to until your teeth fall out. Actually, there is no real objection to any operator using one, no matter what class license he has, if he has skill enough to operate it, and the receiving operator can receive well enough to copy it, both rather big *if's* among Novices because of their limited experience. It is one of those problems, however, that solve themselves. If the operator does not send properly he has difficulty making contacts and soon goes back to a straight key, until he masters the bug.

The second question presents something of a problem. About all that can be said about it is that many two-meter stations are equipped for c.w., and if one is persistent enough, he can usually stir up some c.w. activity.

73, Herb, W9EGQ

QTH COLUMN

(from page 40)

KT1LM	U.S. Legation, Tangiers.
JA7AR	APO 917, PM, San Francisco, Cal.
HP1AB	Henrique Arango, Jr., Apartado 846, Panama, RP.
JY1AJ	1920927 SAC George Haley, MAFRAQ DET C/O/RAF, Amman, Jordan, MEAF 2.
VQ2JW	Jimmy Warren, Nangweshi, P.O. Sechele, Barotseland, via Livingstone, N. Rhodesia.
VU5AB	G2FRM, Car Nicobar Island, QSL to G2MI only.
MP4KAD	Zaman Akil, Box 54, Kuwait.
PX1YR	Yves Ramond, Radio Electrician, Andorre-la-Vieille, Andorra.
9B3AA	Via 9S4AX

Thanks for the above goes to W2CTO, W9YFV, VK3-CX, W1NWO, G2MI and the West Gulf DX Bulletin.

NEW PREFIX ASSIGNMENTS

AMA-AOZ	Spain
JYA-JYZ	Jordan
JZA-JZZ	Dutch New Guinea
4YA-4YZ	International Civil Aviation
5CA-5CZ	French Morocco
9AA-9AZ	San Marino
9NA-9SZ	Nepal

(Courtesy West Gulf DX Bulletin)

YL

(from page 48)

new friendships all over the world. I don't care to go hunting for new countries; I just like to have a friendly chat with some of the many friends scattered in every part of the globe."

IS1EHM consists of a home-built 100-watt transmitter using a 6SK7 as a Clapp oscillator, 6SH7 doubler, 6V6 doubler, 807 p.a., a.f. amplifier 6SJ7-6SH7-6L6, modulator PP 807s (class AB_2). The receiver is a BC-342-N and the antenna is a center-fed half-wave running North and South. Because of the antenna system Maria is on 20 meters only, but so far she has worked 90 countries, 80% of them located East and South of her position. Her QSOs with North and South America are few because of a hill which absorbs most of the signal directed to the west. But Maria expects to move to a new QTH soon and has a 3-element beam all ready to go up at the new location.

Maria lives in Cagliari, the capitol of Sardinia and located on the southern coast of the island, with a population of 140,000. She is studying chemistry and says that next year she'll have her doctor's degree. Good luck, Maria, and pleasant QSOs!

IPOIO

(from page 32)

Solution: Design it as an oscillator. Nothing under the sun will make it oscillate. Conversely, all oscillators should be designed as amplifiers.

VI. Controlling Weather

Problem: *To produce a storm* (why anyone wants to do this is beyond me, but people are doing it daily).

Solution: Construct a rotary beam. When the last bolt has been tightened and coated with aluminum paint, call in all your friends for the big erection ceremony. *IPOIO* will supply you with a severe hurricane, the worst in the past 50 years.

If the reader has carefully studied the above rules and examples, the basic principles of IPOIO should be at his command. Further examples should suggest themselves. However, no course is complete without homework, so the following problems should be worked out.

The answers, barring *IPOIO*, should be on page 63.

Homework Questions

(Note: *If some of the students' answers differ slightly from those given, but still show understanding of IPOIO, he will be given full credit for the course.*)

1. How will you find the proper element spacing for a three-element beam in your particular location?
2. A ham moves to a new town. Where will he be able to find a house which is readily available and suitable to his income bracket?
3. By some apparent failure of *IPOIO*, the lot next to yours is vacant. The owner is friendly and has no objection to its use for rhombics. What will happen shortly after the last antenna has been completed?
4. Neighbor A is 5'3" and weighs 115. Neighbor B is 6'6", weighs 230 pounds and is a former boxer. Which will have severe TVI?
5. Determined to avoid TVI, you move to a town where there are no stations. Soon thereafter you learn that a new TV station will go into operation within a month. What channel will it be on?
6. Neighbor X is between you and the TV station. You are between Neighbor Y and the TV station. Which one will buy a set?
7. You only have one cold a year and that one is a lulu. When will it occur?
8. Conditions have been terrible. How can you make them improve?
9. You are running 1 KW and have a four element rotary. You work a VK using a doublet and 20 watts input. His signal is 589. What is yours?
10. A faulty tube in a receiver is replaced by a new tube, right out of the carton. What is the mathematical probability that the new tube will also be defective?

ZANZIBAR

(from page 54)

After an hour and a half, someone said the whole W band was calling us, and W8GZ, W1DR, and W3DOE were the first three, in that order, to make the grade. For another hour and a half, the pace continued furiously; then we began fighting for contacts, until finally we had it for the night.

Conditions deteriorated steadily, and by the twelfth, it was practically impossible to make a phone contact; so I switched to c.w. Not being a c.w. man, I was not sure that I could control the situation, but as our object was to work as many stations as possible, it would be more profitable to try it, even if I made a mess of it, than to sit idly by waiting for the phone band to open.

ZD6PL was the first c.w. contact at 1840 GMT, followed by simultaneous calls from W4CEN and W1CLX, worked in that order. As I had been on the air only three minutes, it proves that the W fellows don't miss much! Everybody was well behaved and I made several more contacts in the next hour.

About the sixteenth, Doc had to leave us, because of a fire at home, but we retained his equipment. On the nineteenth, the *Yankee* dropped anchor at Zanzibar, and on the twenty-second, Ian and myself, and two members of the crew, Jim and Tom, flew to Nakuru to spend Christmas at the farm, leaving Morgan in charge of the station. He was soon joined by Bob, W3KIF/VQ3KIF/VQ4KIF, whose ship was in Dar-es-Salaam. Bob worked many stations on c.w. during his brief visit.

I got back to Zanzibar on January 2, 1952, and Morgan and I kept the station on the air until 0907 GMT, January 6. VQ3PBD, being our last as well as first contact. Morgan sailed for Durban the next day, and I left the day after.

Remarks

The average standard of phone operation was much higher than we expected. That of W phones was extremely good, and so was that of the VK's and ZS's. We had practically no trouble with phone stations trying to "break" a QSO.

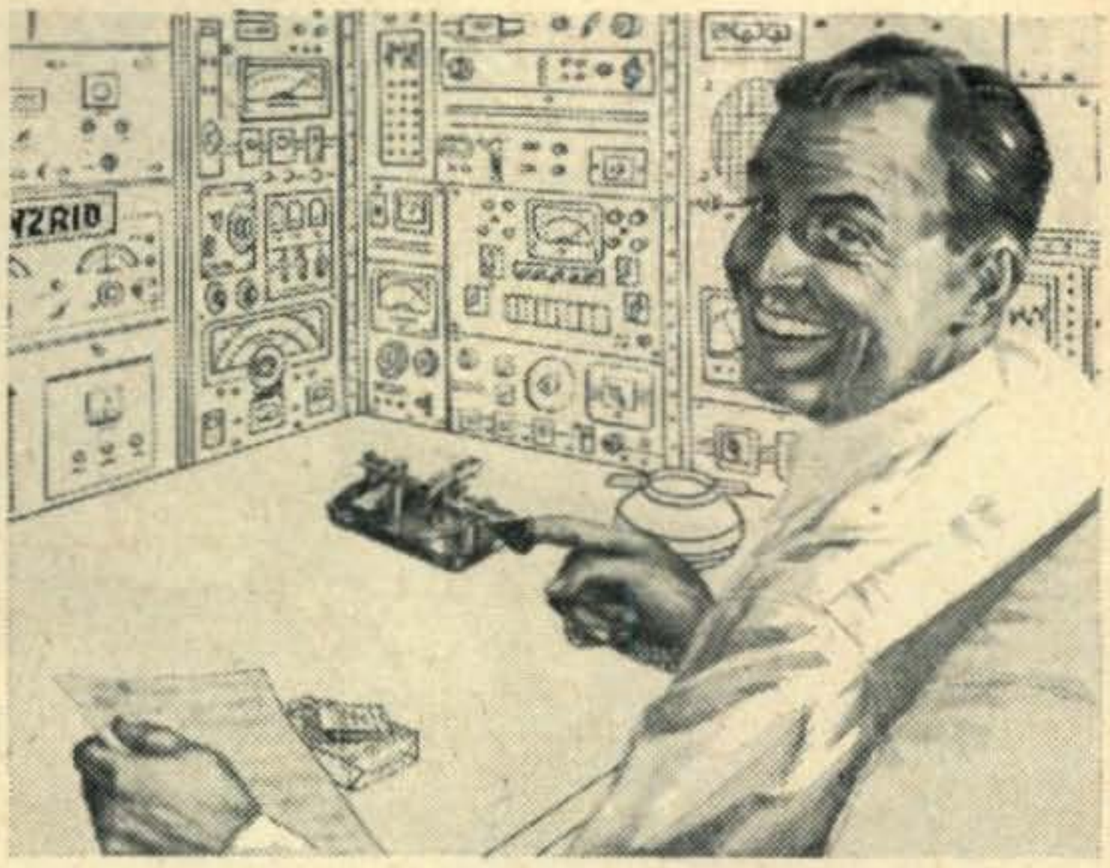
The majority of c.w. fellows also played the game, but I had considerable trouble with stations trying to "break" me and from stations calling continuously, even while I was in QSO. Also, many stations persisted in calling dead on our frequency, even though I repeatedly requested them not to. These tactics cost many of them a VQ1 contact!

QSL's

I am handling VQ1RF QSL's on a card-for-card basis through the bureaus. Stations wanting them direct or by air mail must include sufficient reply coupons. It will help me—and any DX station who works many stations—if the time is given in GMT; otherwise it is often difficult to identify the QSO among the hundreds we made.

Cards I receive for contacts that I cannot verify will be returned with a note. This is necessary, because the call VQ1RF was extensively pirated. I have already received many cards for 3.5-mc contacts and we had only one 3.5-mc QSO, and that with a VQ4. Incidentally, VQ1AA was definitely a phony, who disappeared when we called him.

VQ1RF worked over 1200 stations in over 80 countries, and had conditions been at all reasonable, we would have at least doubled both records. However, that was just one of those things, and we fellows who made the trip thoroughly enjoyed ourselves, and we hope we gave you a kick.



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SCRATCHI

(from page 4)

Scratchi! Aha, Scratchi are getting the amchoor coming and going. (Hon. Ed., please don't rushing out rite now to sending me money, waiting till you finish reeding this letter.)

Can't you seeing the ads now! "Why Be an SB (Single-Bander)?" — "Don't Get Caught on a Dead Band with your Antenna Down" — "Buy an All-Band Transmitter which is Really on All Bands (at the same time)" — Know the Thrill of Getting Answers to your Seek-You on Nine Bands at Once"—"When You Press that Key, Why Be a Piker, Use the Scratchi White Box and Really Get On the Air". Way down at bottom of ad can put in sumthing like: "Low Price, Easy Terms, a 3-Cent Stamp As Deposit Will Hold Your Purchase Till You Can Cough Up the Hole Amount". For catch phrase in advertising campaign we can using: "Be Happy, Go Scratchi", or, "The Scratchi White Box Does Everything".

Those are my ruff plans, Hon. Ed., so now you can dig down in your pocket for your fountain pen and writing me a check. Don't go to lot of trubble — make it in nice even number, like one thousand bux. Hokay? Oh, gracious to goodness, I not telling you the secrut of my xmitter. Make sure nobuddy is peeking over your shoulder. All set? Hee-hee, it so simple, Hon. Ed., I are surprising no other fokes thinking of it. All are doing is designing 160 meter oscillator and 160 meter final. The final are having plate coil designed so it radiating harmonics like mad. So, when actshooally on 160 meters are also having joocy harmonics on 80, 40, 20 and all bands down to 2 meters. Sum idea, you not thinking? I accidentally getting idea when having TVI trubble recently.

Letting me know post-hasty how you like Scratchi's idea. To saving paper, you can writing your comments on the back of the check. Oh, by the way, Hon. Ed., what color Kadilac are you going to buy now? I intending to get slick convertible for using in daytime, and big sedan so can having chauffeer drive me around at nite.

Yours anxiously,
Hashafisti Scratchi

GUEST EDITORIAL

(from page 10)

Tenth Air Force area:
Selfridge Air Force Base, Michigan.
North Dakota, South Dakota, Wyoming, Colorado, Kansas, Nebraska, Minnesota, Wisconsin, Iowa, Missouri, Illinois, Indiana, Michigan.

Fourteenth Air Force area:
Robbins Air Force Base, Georgia.
New Mexico, Oklahoma, Arkansas, Tennessee, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, Texas.

6155 TUBE

(from page 26)

proved stability. Using the 6155s it was possible to rotate the plate tuning adjustment over a much wider range before the amplifier showed signs of "taking off" on a tuned-plate-tuned-grid mode of parastic oscillation. With old-style tubes it was often noted that neutralization was adequate but not complete for stable operation. Under these conditions grid current did not drop with application of plate voltage but rather tended to stay constant or even rise slightly. As any "old triode" man knows, this is generally an indication of improper neutralization. The new tubes showed a gratifying sag in grid current upon application of plate voltage. Though this is normal and desirable, it calls for more driver output. (A small price to pay for fewer squeaks and squawks during tune-up and less chance of off-band parasites!) Maximum output, minimum plate and maximum grid current all occurred at the same setting of the plate tuning control.

One disadvantage of the new tubes is the fact that the plates show no color even at inputs up to 800 watts. This makes it more difficult to detect unbalance in plate dissipations, and will also make it tough for the guy who tries to tune for maximum efficiency by watching the color of the plates.

Modulation characteristics were practically the same as with conventional 4-125As. Point-by-point checks of r.f. output voltage at several plate and screen voltages indicated reasonable linearity. Self-modulation of the screens by means of a series a.f. choke was tried, and found to work equally well with either set of tubes.

For the record, the operating conditions employed during these comparative tests are listed in tabular form in *Table 1.* Comparisons of power output were made at the 1,000 volt level. Antenna coupling was adjusted for maximum r.f. power output (regardless of efficiency) at 1,000 volts and the specified drive and screen voltages; for each set of tubes. Absolute measurements of power output are not shown here due to lack of faith in the available power-measuring equipment!

	500		1000		2000	
Plate Voltage (volts)	4-125A's	6155's	4-125A's	6155's	4-125A's	6155's
Plate Current (ma.)	90	80	180	170	400	390
Screen Voltage (volts)	80	80	180	180	360	360
Screen Current 5000*)	37	37	45	45	60	70
Fixed Grid Bias (ma.)	25	25	25	25	25	25
Grid Current (ma. through	100	-100	-100	-100	-100	-100
(volts)						
Input to 829-B Driver Plate (watts)	55	53	66	65	88	96

NEXT MONTH

look for this CQ Cover Photo— it will be on the

FIRST ANNUAL MOBILE SPECIAL MAY ISSUE

For the past six months the new staff of CQ Magazine has been working hard on the 120-plus page 1st Annual Mobile Special Issue.

Mobile operation is rapidly becoming one of the most important phases of amateur radio. CQ feels that on at least one occasion each year the subject should be given special attention.

The Annual Mobile Special is our answer. Be sure to reserve your copy early because this issue will completely cover mobile ham radio, and is sure to sell out fast.

YOUR DEALER OR NEWS STAND WILL SELL COPIES, WHILE THE SUPPLY LASTS, AT THE REGULAR PRICE OF 35c EACH. WHEN THEIR SUPPLY IS SOLD OUT, COPIES ORDERED FROM THE PUBLISHER WILL COST 50c EACH.

We do not have the space to give you a resume of *all* the features in this gigantic (for CQ) issue — but, here are a few:

- "The Mobile Special" a V.F.O. Three band transmitter designed by Contributing Editor, Bill Scherer, W2AEF, as a fitting companion to his "Another Standard of Comparison" receiver.
- "The Mobileer and the Law" another in the series by Maurice Hindin, W6EUV, author of the classic "The Skywire and the Law."
- "Two Meters on the Tri-band" by Technical Editor, Miles Brown, W2PAU. A crystal controlled 144 mc miniature converter.
- "Mobiling with the SCR-274" (by numerous requests) a thorough conversion of 274N (or ARC-5) to 75.20 and 10 meter mobile. Authorized by Lt. Paul Lee, W4RXO.

(And a dozen more like these.)

ROTHMAN SYSTEM

(from page 23)

to exceed optimum screen feedback since this will in all cases decrease the plate efficiency of the modulated stage. Correct procedure is to start with insufficient coupling; e.g., one turn or less, and gradually increase coupling until the desired input power is obtained or until a decrease in antenna current is noted. Should this point be reached before desired plate input is obtained an increase in plate voltage is indicated. Thus the degree of output coupling to the r.f. load affects the amount of energy in the plate tank and therefore the screen feedback link, adjustment of output coupling and feedback coupling are interpendent.

In some tubes zero carrier level cannot be achieved with zero screen voltage. In such cases, 100% modulation may nevertheless be achieved by the addition of a negative bias battery in series with the screen lead from the modulator, *Fig. 1.* This bias requirement will usually not exceed 22½ volts.

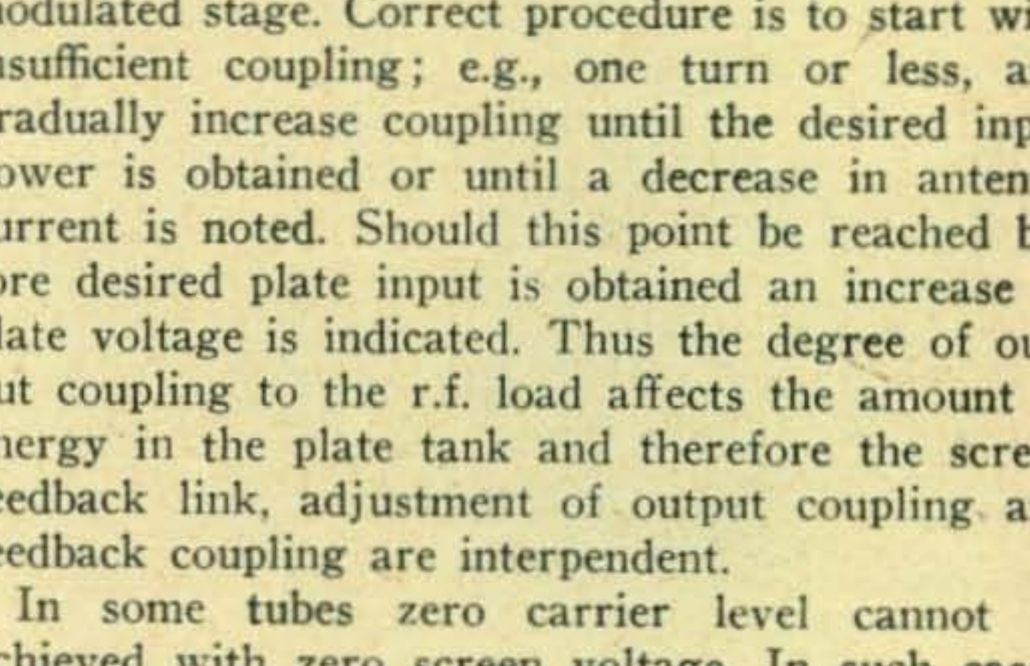


Fig. 3. An alternate method of obtaining r.f. from the plate tank coil.

Advantages and Limitations of the System.

a. High efficiency modulation is achieved without the use of expensive and bulky high level modulation equipment.

b. Screen power supplies are not required for the system.

c. Protection from high off-resonance plate currents is achieved since screen power is generated only at resonance. Thus protective fixed grid bias is unnecessary and grid leak bias may be used exclusively.

d. Class A quality is easily achieved since straight resistance coupled stages are used throughout, and demodulated carrier feedback is utilized to overcome non-linearity of the screen characteristic.

e. Controlled carrier build-up is essentially instantaneous due to regenerative action, thereby preventing envelope distortion.

f. The system requires higher plate voltage at lower plate current than a conventional plate modulated stage.

g. The system is not advantageous when used with tubes which do not have suitably related screen power to output power ratings. This limitation, however, is not serious since an adequate number of suitable tubes for all

power levels are available. Within practical limits, this disadvantage may be eliminated even with poorly suited r.f. tubes, provided that a cathode follower is utilized to supply the screen power (see *Figure 2*).

h. Linear modulation may be accomplished at any frequency which is suitably related to the carrier frequency.

Conclusion

The *Rothman System of Modulation* is a simple, versatile and economical means of producing high-efficiency, high fidelity amplitude modulation with a minimum of size and weight requirement. While the system is ideally suited to communications applications it also possesses exceptional versatility in the video field wherein unusually high-frequency modulation components are encountered, e.g., in television transmitters which presently use control grid modulation, it is estimated that the use of *Rothman Modulation* would enable a 75% increase of r.f power output for a given plate power input.

420 mc Amplifier

(from page 15)

To key the 4X150A tripler amplifier, a combination of fixed and grid leak bias may be used so that the driver stages may be keyed, or a grid block keying system. Another very practical method can be called screen grid keying. When grounding the screen grid the plate current goes to zero, resulting in no r.f. power output.

This amplifier will operate on almost any plate voltage from 180 to over 1000 volts, depending on the power output desired. When plate voltages of 600 volts or less are to be used, the screen grid voltage may be obtained from a voltage dropping resistance. However, best modulation linearity will be obtained with the screen grid voltage tapped from a bleeder resistance.

The author wishes to express his appreciation for the help of R. M. Mitchell and Louis Ronk, of Collins Radio Company, in the design and construction of the amplifier.

Now how did these IPOIO answers get over here?

1. Carefully read all references on the subject. You will find varying answers. The one for you to use will differ from all of them.
2. Next to a power station.
3. A sign will appear on the lot stating that the property has been sold and that a 23-story office building will be erected on the site.
4. Certainly not Mr. A.
5. Channel 2.
6. Y.
7. During the DX Contest or the SS.
8. Go away on vacation.
9. 459.
10. 95.3%.

VHF NEWS

(from page 46)

about 20 watts of power. WN2KLH would like to have more c.w. on 2 as an aid for WNs who find it almost impossible to work out on 80 in the Jamestown area . . . Active on 2 in the Jamestown Amateur Radio Association are **W2TVC, UFZ, YUG, TTW, SBK, BUT, WN2KNC** and **KLH**. Officers are: WN2KNC, president; W2YUG, vice pres.; WN2KLH, secretary-treasurer.

In The West

W7UPF, Tucson, Arizona, offers a report of a commercial VHF contact between Arizona and California as encouragement to the VHF hams in those states, showing it can be done . . . On February 11 at 12:09 p.m., **KOA-255**, City of Tucson Police Radio exchanged calls with **KMA-781**, station F, City of Brawley, California. Mobile units in the Tucson area also heard the Brawley station perfect[1] on 155.01 mc. The Tucson system uses Motorola FM communications equipment. The contact was deliberately brief for the reason that the operators were not sure of the FCC legality involved . . . Don, **W7UPF**, says he has been on 2 "sometimes" but certainly will now be on more in the future!

W7QLZ has moved from Phoenix to the Opal Mine, Oxbow Canyon, about 100 miles northwest of the old QTH. Clyde gave all of his big transmitters to the West Phoenix High School Radio Club (Don Stone, W7KTJ, principal) and heard later they're putting the 2-meter rig on **160!!** On February 2 and 3, W7QLZ trekked to the 7500 ft. level of the Hualapi Mountains, south of Kingman City, and operated on 2 and 420, but nothing was heard. The location seems to be a good one and Clyde plans a trip to the 8400 ft. level after the snow melts. The spot is about 300 miles from Tucson, 200 miles from Phoenix, and provides a clear path into California. Schedules are held with W7FGG. Other interested hams may contact Clyde via P.O. Box 1962, Phoenix, Arizona. He expects to be back in Phoenix in early May, but will operate 6 and other bands only with low power from now on.

In Cheyenne, Wyoming, **W7OWZ**, keeps company on two meters with **WØELL, WØFRQ, WØNDJ, W7MVK W7MWS**. New prospects are **W7KUB** and **WØVIK**. **WØELL** and **W7OWZ** can and will work you on c.w. at the flip of a switch, if you wish. **W7OWZ's** two-meter "Scoreboard" totals are: 3 states, 2 call areas and 130 miles DX, which is good in that sparsely VHF-populated area. Ben wants us to continue the list of "Firsts on Two" once started in "The VHF News" when it was independent. This I'd like to do, but someone will have to help on the researching . . . **W7JRG**, now in Billings, Montana, is operating temporarily with a folded dipole on 6 but finds practically no VHF activity in town. He did run across one ham who has some 2-meter gear, however. Ken says that it will take some time, but he'll be back in business, eventually.

NEW FCC RENEWAL APPLICATION

On the 5th of March 1952 the Federal Communications Commission announced that starting 15 April 1952 routine renewal applications for amateur licenses could be applied for through the use of the "short form 405A." This application is a drastic reduction in the amount of paper work involved in license renewals. It is to be completely filled out and authenticated by the individual amateur.

If you are planning on making application for license renewal after the 15th of April, be sure to consult your local FCC office and obtain further information on the "short form 405A."

ASIA

Propagation conditions for Near East Circuits are quite similar to European circuits. Signals can be expected to be weaker because of the increased absorption on those longer circuits. No **ten meter** openings expected, fair to good **twenty meter** openings, some **forty meter** activity, not much possibilities for **eighty.**

Some good **twenty meter** openings are expected from Japan and the Far East area to the Pacific Coast These circuits, because of auroral zone penetration, become poorer as they extend Eastward. **Forty meters** and to a lesser extent **eighty meters** should open fairly occasionally to the Pacific Coast during the all dark period, with some openings also possible to the Central & Eastern areas of the USA. Not much **ten meter** activity is expected. Conditions are improving to India and Central Asia, and probably are at their best during the equinox period.

No **ten meter** openings expected, but **twenty** should support some activity from these areas. There is also the possibility of some **forty meter** openings and infrequent **eighty meter** openings to the Pacific Coast. These circuits can arrive from either the long or short great circle routes. The Propagation Tables indicate times of band openings for the shorter paths. The long path to the Pacific Coast is usually over Europe and the Auroral Zone, while the short path is generally over Siberia and Alaska. The short path for Eastern and Central USA is generally over Russia, Scandinavia and Southern Greenland, while the long path is usually over Asia and the North Pole.

All circuits from the East, favor East and Central USA QTH's, while Western Circuits favor the Pacific Coast.

HQ-129X CONVERSION

(from page 19)

for the receiver. This may be done with the aid of a crystal standard, or a simple check against WWV. The dial calibration should appear essentially the same. Re-calibration of the set may be accomplished by adjusting the oscillator trimmers for each band if absolute accuracy is desired, but this should only be done with a crystal standard as the signal source.

No attempt was made to accurately measure the improvement in the signal-to-noise since a noise generator was not available before the change was made. A very noticeable improvement is apparent to the ear, particularly on ten and twenty meters. It should be evident that the relative improvement that exists depends to a large extent on the average man-made noise level at the receiver location. Any noise entering the receiver thru the power lines must be adequately filtered. Whatever noise comes from the antenna must be quite low in order to appreciate an improvement in signal-to-noise ratio. An improvement is only desirable in a system where the gain may be maintained close to a maximum.

Some work has been done in an attempt to replace the 6SS7 r.f. amplifier with a 6BQ7 "cascode" input stage, but it was found impossible to prevent oscillation without a major redesign of the antenna input or r.f. output coils. Other tubes of both the miniature and octal type were tried but it was impossible to improve the receiver any further and keep within the modification limitations that were previously mentioned. For any one band there is no doubt that a real improvement can be made by adding an "outboard" r.f. stage using the 6BQ7 or 6BK7 in the "cascode" circuit.

Classified Ads

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

BARGAINS: EXTRA SPECIAL! Motorola P-69-13 mobile receivers $29.50; Globe King $315.00; HT9 $199.00; HRO-50 $299.00; Lysco 600 $109.00; SP400X $249.00; HRO-7 $199.00; Collins 75A1 $275.00; HRO-5T $175.00; SX-71 $159.00; HRO senior $119.50; RME-2-11 $99.50; RME-45 $99.00; Meissner EX Shifter $59.50; S-40A or SX-16 $69.50; VHF-152A $69.00; HF-10-20 $59.00; SX-24 $69.00; Globe Trotter $79.50; Meissner Signal Calibrators $24.95; MB611 mobile transmitter $29.00; 90800 exciter $29.50; XE10 $14.95; and many others. LARGE STOCK TRADE-INS: Free trial. Terms financed by Leo, WØGFQ. Write for catalog and best deal to World Radio Laboratories, Council Bluffs, Iowa.

JOHNSON VIKING 4D32 final and Viking VFO, both for $300.00 Collins 75A2 and speaker, perfect, $375.00. Heathkit scope, $30.00. Eico VTVM $22.00. National modulation scope, never used, $20.00. Everything in new condition. Philip Schwebler, W2ZHE, 61-31 Madison St., Brooklyn 27, N.Y.

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, 174, 175, other "TS-", particularly microwave equipment, spectrum analyzers: G-R, Ferris, etc. units; 723A/B, 3C22, all tubes: manuals, meters, parts, cable. Quick cash, or trade TV, SX-28, astronomical telescope etc. Littell, Farhills Box 26C, Dayton 9, Ohio.

FOR SALE: Amphenol connectors. New. Cheap. Palmer, W2TMI, 112 Lake, Blasdell, N. Y.

SELL OR TRADE: Globe King coils for 160-10 on air. New 522, S40 receiver. Mobile transmitter with PE103, 50 watts input. Morrow 2 BC convert 10 and 75. Want BC610, Collins, SX42, HRO, what have you. Don Clark, W7OHG, 105 N.W. Main St., Blackfoot, Idaho.

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

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 Ave., Worthington, Minnesota.

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.

COUNCILOR wanted for Maine Boys' camp for summer. License required to operate Ham voice station. 20 years minimum age. Healy, 18 Floral, Hastings, N. Y.

TECHRAD XMTR model T350XM. Two 813's final, two 805's mod. master osc. plus 5 xtal position switch. Frequency 2 to 20 mc. Original condition, used 100 hours. $750.00 crated. F.O.B. Earle Davis, W6WWI, 4306 W. 60 St., Los Angeles, Calif.

BARGAINS: New and reconditioned Collins, Hallicrafters, National, Hammarlund, Harvey-Wells, Gonset, Lysco, Millen, RME, Meissner, Eimac, Morrow, others. Reconditioned S38 $29.00, S40A $69.00, SX43 $119.00, SX71 $149.00, SX42 $199.00, SX62 $199.00, SW54 $35.00, NC57 $69.00, NC173 $139.00, HQ129X $139.00, SX25, S72, SX28A, NC183, HFS, HRO7, HRO50, HRO50-1, SP400X, HF-10-20, VHF152A, RME45, Collins 75A1, others. Shipped on trial. Terms. List free. Henry Radio, Butler, Missouri.

FOR SALE: Collins 30J-1 500 watt phone-c.w. transmitter. Excellent condition. $475. W6ITH, Moraga, Calif.

MASTER MOUNTS all chrome antenna (75 m. coil) and chrome 132X mount—no more of these available in original cartons including M-20 extra coil $18.00. Brand new Turner microphones: 99 Dynamic $9.00, Model 22X with stand $9.00. Used Astatic (new xtal) with stand, $9.00. WØCVU. P. O. Box 224, Cedar Rapids, Iowa.

SELL - TRADE Japanese equipment: Aircraft xmtr-rcvr, dynamotors, handkey, meters, studio ribbon mike with call letters "JOAK" with velvet-lined case, miscellaneous small parts. Want wire or tape recorder, VHF-152. Write for description. WØENH, 109 W. Filmore, Jefferson City, Mo.

INSTRUCTOGRAPH code sender, 10 rolls of tape. 110 v. ac operation. Oscillator built in. Excellent condition. $22.50. H. N. Retherford, 10306 Otis St. So. Gate, Calif.

ANNOUNCING ARRL New England Division Convention and Hamfest, sponsored by Hampden County Radio Club, at Eastern States Exposition Grounds, West Springfield, Mass., Saturday, June 14, 1952. Registration, and banquet, $5.00. Registration only, $2.00. Send checks to Albert Jackson, W1OBQ, Treasurer, P.O. Box 221, Springfield, Mass.

WARNING- Do not buy BC348-R Serial 4103. Lost in mail, Guam to West Virginia. Ten bucks reward for locating. W8QDW, 2306 Center St., Moundsville, W. Va.

QSL CARDS? Unbeatable! Samples 20c. Sackers, W8DED, Holland, Mich.

COLLINS 75A2 brand new receiver with matching speaker, original factory cartons, 3 weeks old, will trade suitable swap for 1947-8 Chevrolet or Ford, 1st class condition. Going South. Receiver too new to ship. Jim Meade, W2VE, 2937 Far Rockaway Boulevard, Far Rockaway, N. Y. Far Rockaway 7-5364.

JOHNSON VIKING VFOs have proven themselves in actual practice and on-the-air use. Although normally available in only kit form we can supply them wired, tested, with tubes, for only $54.95. Just as a reminder, we also supply the Johnson Viking transmitter complete at $275.00. Trades and terms available on both VFOs or transmitters. Many used items are also available; write for latest list to W1BFT, Evans Radio, Concord, N.H.

FOR SALE: Eicor dynamotors, 6 volt imput, 600 volt 250 ma output. $20.00 each. W4OSN, Ralph Queen, 7136 Lone Oak St., Spartanburg, S.C.

WANT: ART-13, ATC, PE-237, BC-1306, SCR-694, GN-58, DY-12, BC-348, BC-342, BC-221. Sell: RBB Navy receiver 500-400 kc. What have you to trade or sell? T. Clark Howard, W-1-AFN, 46 Mt. Vernon St. Boston 8, Mass.

NOVICE TRANSMITTER KITS including key, crystal, tubes, power supply, all parts, 80 or 11 meters, 35 watts $35.75, 75 watts $49.95. Send $10.00, balance C.O.D.; express inspection permitted. WN8IPJ 17569 Greenview, Detroit 19, Mich.

GEIGER COUNTER, perfect condition with two spare batteries, $19.50. WN8IPJ, 17569 Greenview, Detroit 19, Mich.

WANTED: ART-13, ATC. TCS-6 or later, SCR-694, BC-1306, and their power supplies, controls, cables, parts. PE-237, GN-58, GN45, PE-103, PE-104, DY-12, BC-348, BC-342, BC-221, RA-34-A to J,RA-62, ARC-1, BC-610-E. Technical Manuals. Arrow Appliance, 25 Harrison Court, Lynn, Mass. (Lynn 2-2200)

SELL- Transmitter, bandswitching all bands, cabinet rack, conservative 600 watts CW, 200 watts fone, absolutely no TVI or BCI. J. Mowry, 2099 Cornell Rd., Cleveland 6, Ohio.

DUE TO THE DEATH OF MY HUSBAND I have for sale: BC 610C transmitter, complete with BC-614C speech amplifier, also PE103A Dynamotor, miscellaneous crystals, transmitting tubes, including 250TH and 100TH, etc. Write for prices. Mrs. Gabriel Uljon, Windfall Rd., St. Mary's Pa.

QSLs! Samples 3c. Tooker, Box 71, Lakehurst, New Jersey.

ANTENNA ROTATORS as advertised January CQ still available. Also many other surplus items. Write for list. Paul Swan, 2801 Ohio, Topeka, Kansas.

BC-459A, (new) $14.95. BC-357G (new) $14.90. O.Q. target planes $88.50 up. Bogen noise generator, six tubes, speaker, original carton, $14.85. Catalogue 10c. Ort, Thomasville, Penna.

HELP WANTED

ELECTRONIC TECHNICIANS for permanent positions with Sandia Corporation, a subsidiary of Western Electric Company which operates the laboratory under contract with the Atomic Energy Commission, in Albuquerque, New Mexico. The laboratory offers excellent working conditions and liberal employee benefits, including paid vacations, sickness benefits, group life insurance and a contributory retirement. Sandia Corporation needs men with Armed Forces acquired radar or electronic experience with trade school or junior college certificate; minimum two years' experience. Versatility, capability and willingness to work are most essential. Albuquerque, center of a metropolitan area of 150,000, is located in the Rio Grande Valley, one mile above sea level. The "Heart of the Land of Enchantment," Albuquerque lies at the foot of the Sandia Mountains which rise to 11,000 feet. Cosmopolitan shopping areas, scenic beauty, historic interest, year 'round sports, and sunny, mild, dry climate make Albuquerque an ideal home. New residents experience little difficulty in obtaining adequate housing in the Albuquerque area. Make application to the General Employment Division, Sandia Corporation, Sandia Base, Albuquerque, New Mexico.

CQ Ad Index

all new and TERRIFIC

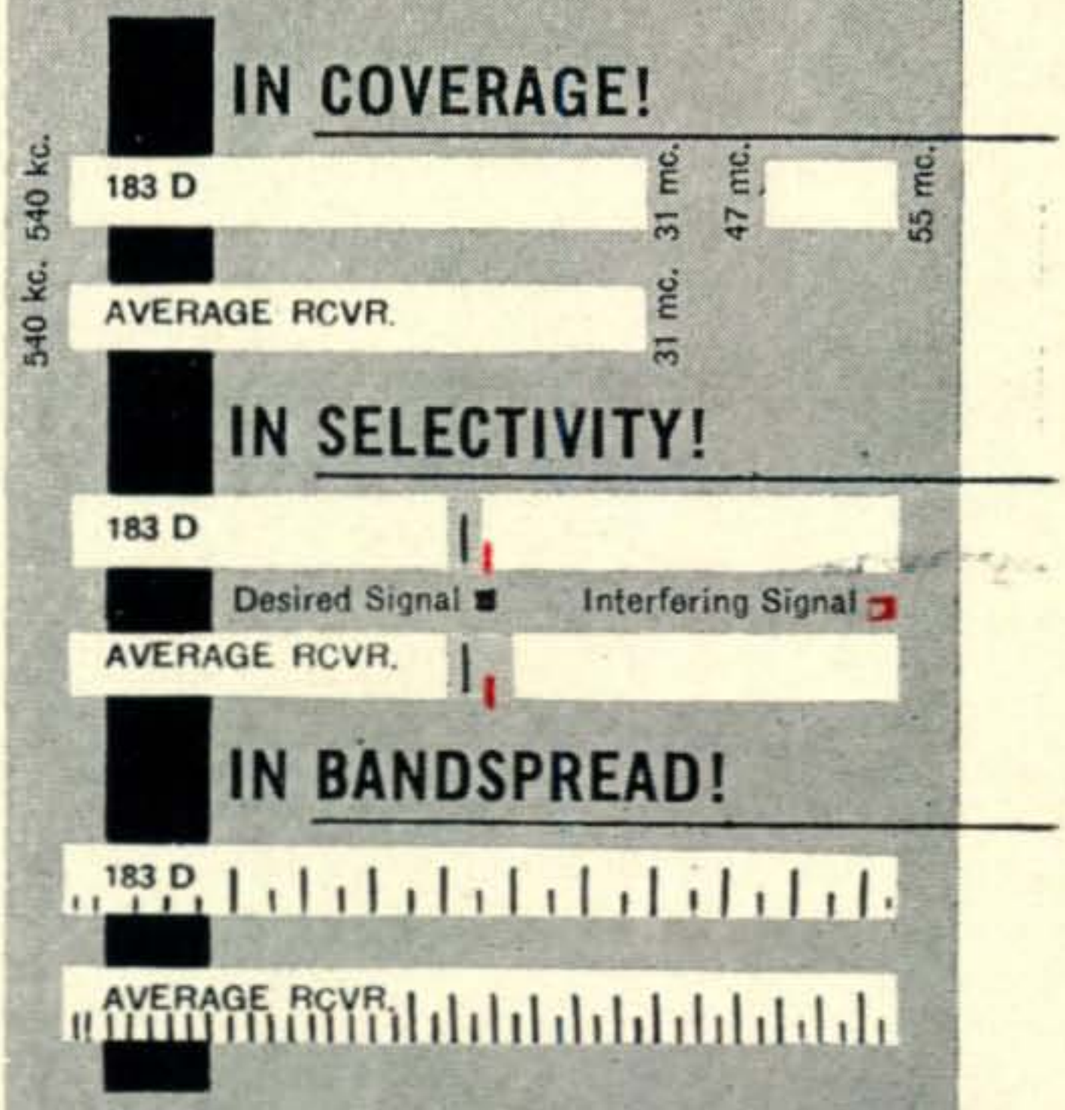
the NC-183 D

DUAL CONVERSION! 12 TUNED I.F. CIRCUITS! 1 M.V. SENSITIVITY ON 6 METERS!

National proudly announces a brand-new receiver — the NC-183D — *every* feature you want in a truly modern receiver! Dual conversion on the three highest ranges (including 6, 10, 20 and 40 meter ham bands) — no "birdies"! Steep-sided skirt selectivity with 3 I. F. stages (*16* tuned circuits on the 3 high bands — *12* on all other bands, compared to 6 normally used) plus a new crystal filter. Approximately 1 microvolt sensitivity on 6 meters for a 10db signal-to-noise ratio! New, indirectly-lighted lucite dial scales! New bi-metallic, temperature-compensated tuning condenser for drift-free operation! *Plus* all the time-tested features of the famous NC-183!

Truly it's the receiver of the year—see it, hear it, compare it!

FIRST.....



National

NC

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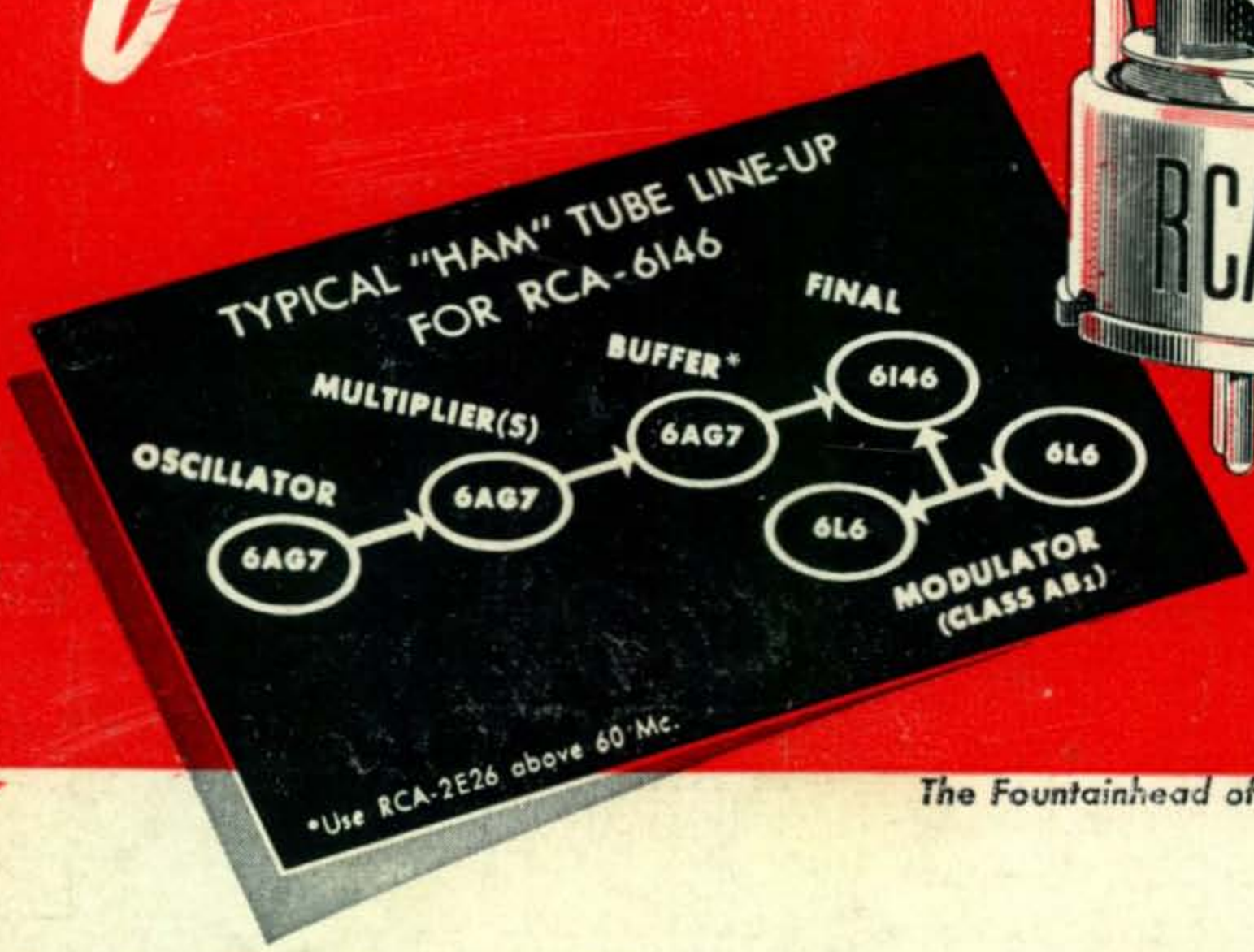
NATIONAL COMPANY, Inc.

MALDEN, MASSACHUSETTS

"Headliner for '52"

ACTUAL SIZE



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You're looking at the biggest $4.90 worth of power—and versatility—ever packaged into a single tube. In fact, the new RCA-6146 is capable of performing more services for more amateurs than any other power tube. For instance . . .

Below 60 Mc:—On CW, this rugged tube will handle an input of 90 watts, and can deliver about 69 watts output. On phone, the RCA-6146 will take an input of 67.5 watts, and can deliver approximately 52 watts output. You can drive the RCA-6146 to full input with a 6AG7 or 5763 . . . to drive any amateur high-power tube.

At 150 Mc:—The RCA-6146 is a natural for 2 meters. With a simple, inexpensive 350-volt power supply, it will handle an input for phone of 44 watts—and can deliver an output of approximately 25 watts. An RCA-2E26 will provide ample driving power. Base pins permit *three* connections to the cathode, to provide good rf grounding.

For Audio:—A pair of 6146's operated Class AB_1 can provide an audio output of 120 watts . . . or 130 watts Class AB_2. A pair of triode-connected 6146's can provide 19 watts output with a total harmonic distortion of 4.6%.

A technical data bulletin is available on the RCA-6146. Ask your **RCA Tube Distributor** for a free copy, or write RCA, Commercial Engineering, Section DM38, Harrison, N. J.

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