CQ

MAY, 1946

W2FX

The Radio Amateurs' Journal

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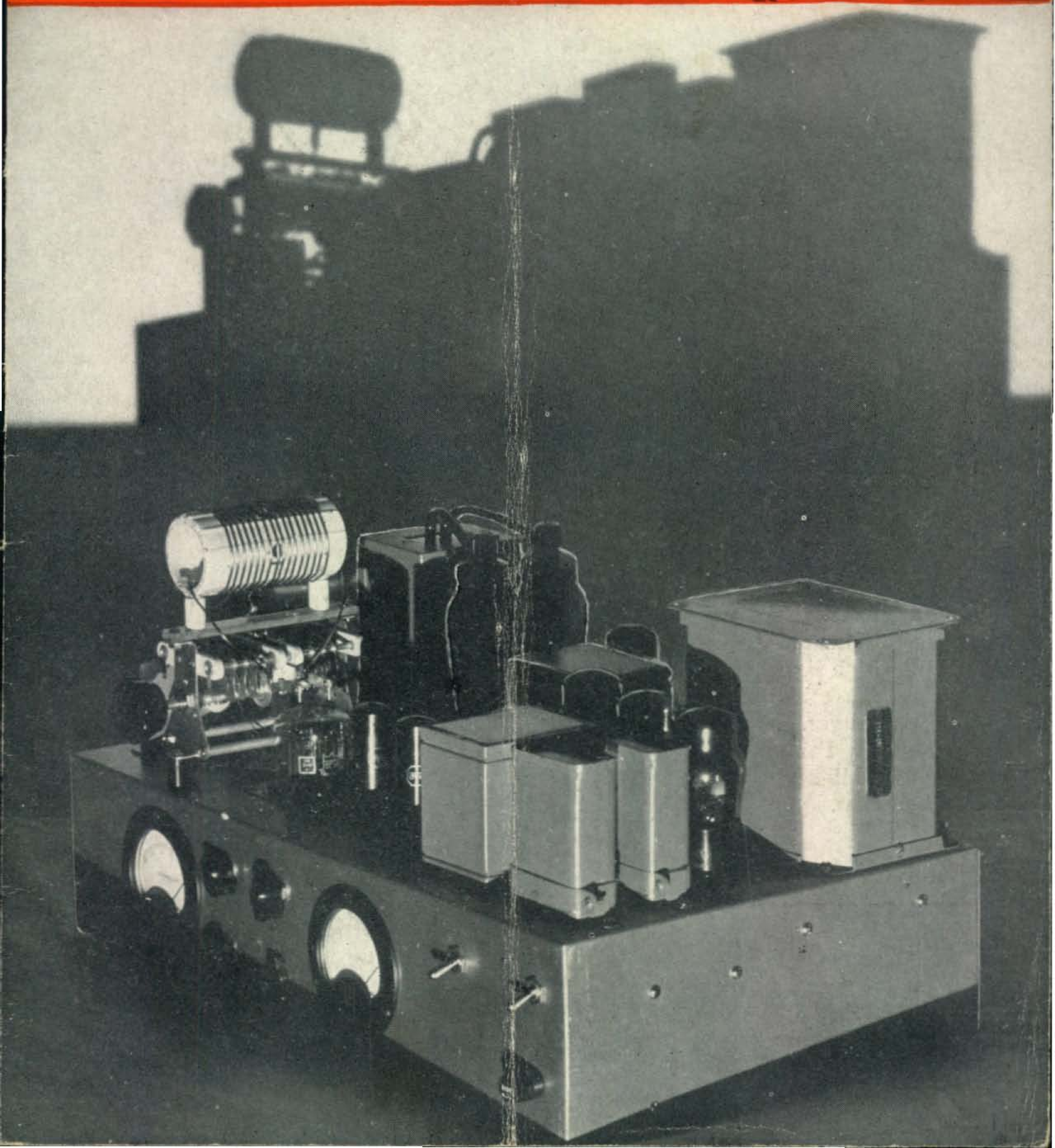

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CQ CQ CQ de ALSIMAG

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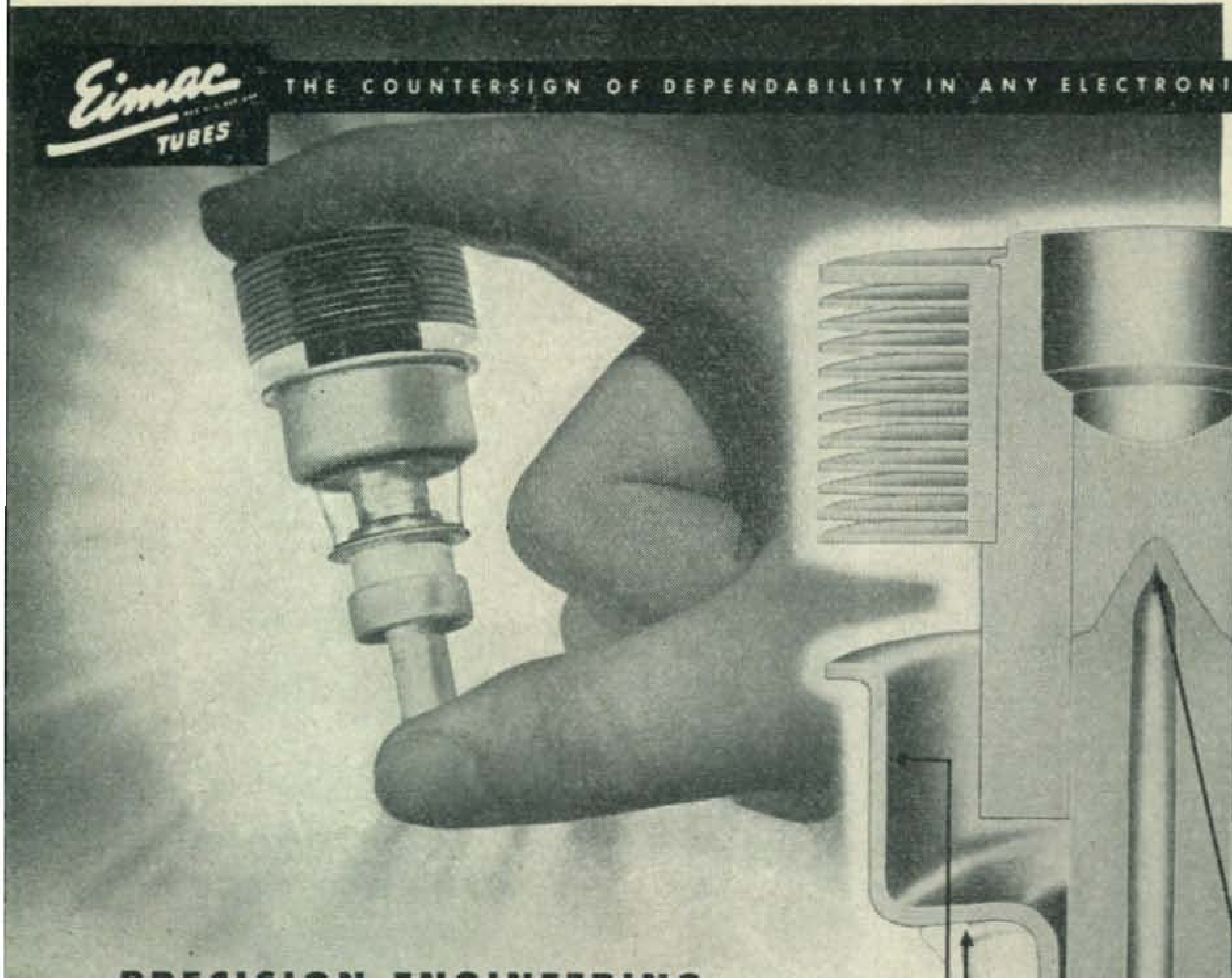
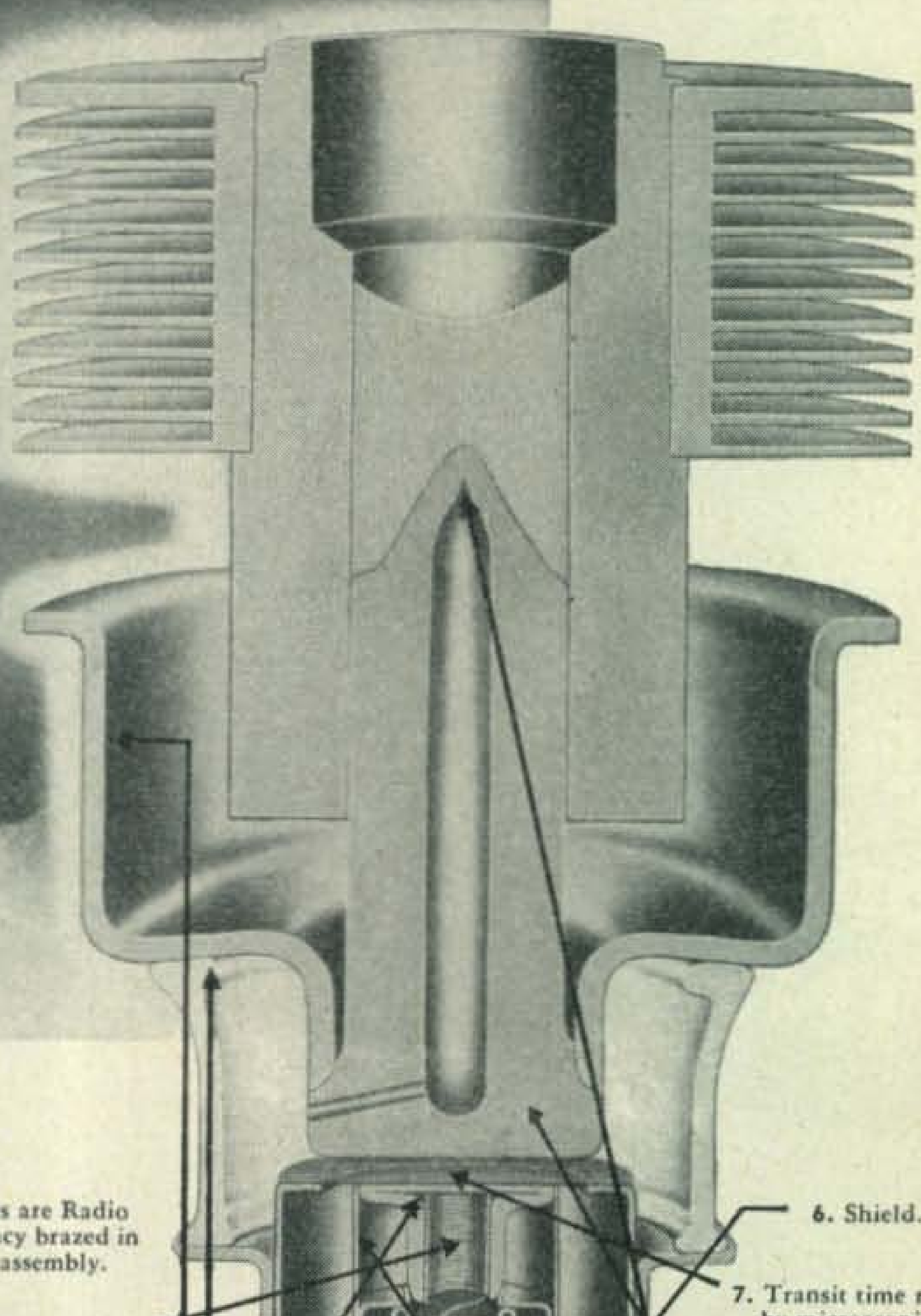


PRECISION ENGINEERING ON A MASS PRODUCTION SCALE



... that's the basic achievement of Eimac engineers in providing typically outstanding Eimac performance in these tiny triodes. Observe the many functions of the Eimac developed 3X100A11/2C39 triode—cross section view. Note actual size shown in photo above.

Designed for special military purposes—these tiny triodes will find valuable application in commercial fields. An indication of their high efficiency is their ability to operate on frequencies up to 2500 megacycles and their high plate dissipation (100 watts) despite the extremely small effective plate area—about the size of a dime.

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TYPE 3X100A11/2C39 EIMAC TRIODE

GENERAL CHARACTERISTICS

ELECTRICAL	
Cathode: Coated unipotential	
Heater Voltage	6.3 volts
Heater Current	1.1 amps
Amplification Factor (Average) 100	
Direct Interelectrode Capacitances (Average)	
Grid-Plate	1.95 $\mu\mu$fd
Grid-Cathode	6.50 $\mu\mu$fd
Plate-Cathode	0.030 $\mu\mu$fd
Transconductance (i_B=75 ma., E_B=600 v.) (Av.)	20,000 μmhos
Maximum Plate Dissipation	100 watts
MECHANICAL	
Maximum Overall Dimensions	
Length . 2.75 inches	Diameter . 1.26 inches

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ROYAL J. HIGGINS (W9AIO)...600 South Michigan Avenue, Room 818, Chicago 5, Illinois. Phone: Harrison 5948. Illinois, Wisconsin, Michigan, Indiana, Ohio, Kentucky, Minnesota, Missouri, Kansas, Nebraska and Iowa.

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CQ

The Radio Amateurs' Journal

JOHN H. POTTS, *Editor* SANFORD R. COWAN, *Publisher*

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Vol. 2 No. 5 **MAY, 1946**

COVER

W2IYO's compact 100 watt phone-c.w. transmitter described in detail on page 9.

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TYPICAL OPERATING CHARACTERISTICS CLASS A1 AMPLIFIER	
Plate current	6.0 Ma.
Plate resistance	0.75 megohm
Screen grid current	2.0 Ma.
Mutual conductance	4200 micromhos
Direct Interelectrode Capacitances	
Grid to plate	.005 micromicrofarad Max.
Input	7.0 micromicrofarads
Output	6.0 micromicrofarads
TYPICAL OPERATING CONDITIONS	
Heater voltage	6.3 volts
Heater current	0.150 ampere
Maximum plate voltage	250.0 volts
Maximum plate dissipation	2.0 watts
Maximum screen grid voltage	250.0 volts
Minimum external negative grid voltage	1.0 volt
Maximum screen grid dissipation	0.75 watts
Maximum heater-cathode voltage	90.0 volts

HERE'S a new sharp cut-off r-f pentode amplifier designed especially for 6.3 volt and a-c/d-c series service in television and FM receivers.

The tube may be operated with full plate voltage on the screen grid to produce high input resistance as a result of reduced electron transit time. Identical voltage requirements for plate and screen grid also eliminate the need of screen grid filter resistors and by-pass capacitors in some circuit applications.

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New FCC Regulations

THE FCC HAS ADOPTED a new set of rules and regulations for amateur operation. Although many of these are similar to those existing before the war, there have been some important changes, almost all for the good of amateur radio. Because of its significance to every amateur, we are publishing the report in its entirety. In order to conserve magazine space at this time when the paper shortage is so acute, the report will be run in three parts.

The complete FCC rules and regulations are required reading for all hams. Among the highlights are: five-year term for licenses instead of three; proof of use of station license no longer required for renewal; contacts required for renewal of operator's license must be on c.w.; telephone procedure is more completely outlined; rigid quiet hour restrictions with provisions to protect FM broadcasting and television as well as standard broadcasting; mobile operation permitted on 11 meters.

With the release of the new regulations the FCC now requires amateurs operating portable to give advance notice, providing location, call, and name of licensee to the inspector in charge of the district in which operation is contemplated. In addition, May 10th was set as a deadline, requiring stations in a permanent location other than those specified in their licenses to notify the inspector in charge of the original home district and the new district of a change in address. Portable designators must be used when stations are operated at permanent locations other than those specified in their station licenses. Mobile operations on frequencies above 25 mc do not require advance notification.

Class D Licenses?

The new rules and regulations for amateur operation include the Class A, B, and C licenses, essentially as we knew them before the war. There has always been discussion within amateur ranks, much of it heated, about the creation of another class of ham license. *CQ* strongly advocates the establishment of such a license—one which will be easier to obtain than the Class B. We do not propose that this move be made immediately, nor do we suggest that holders of such a license be permitted to operate on the now existing regular amateur bands.

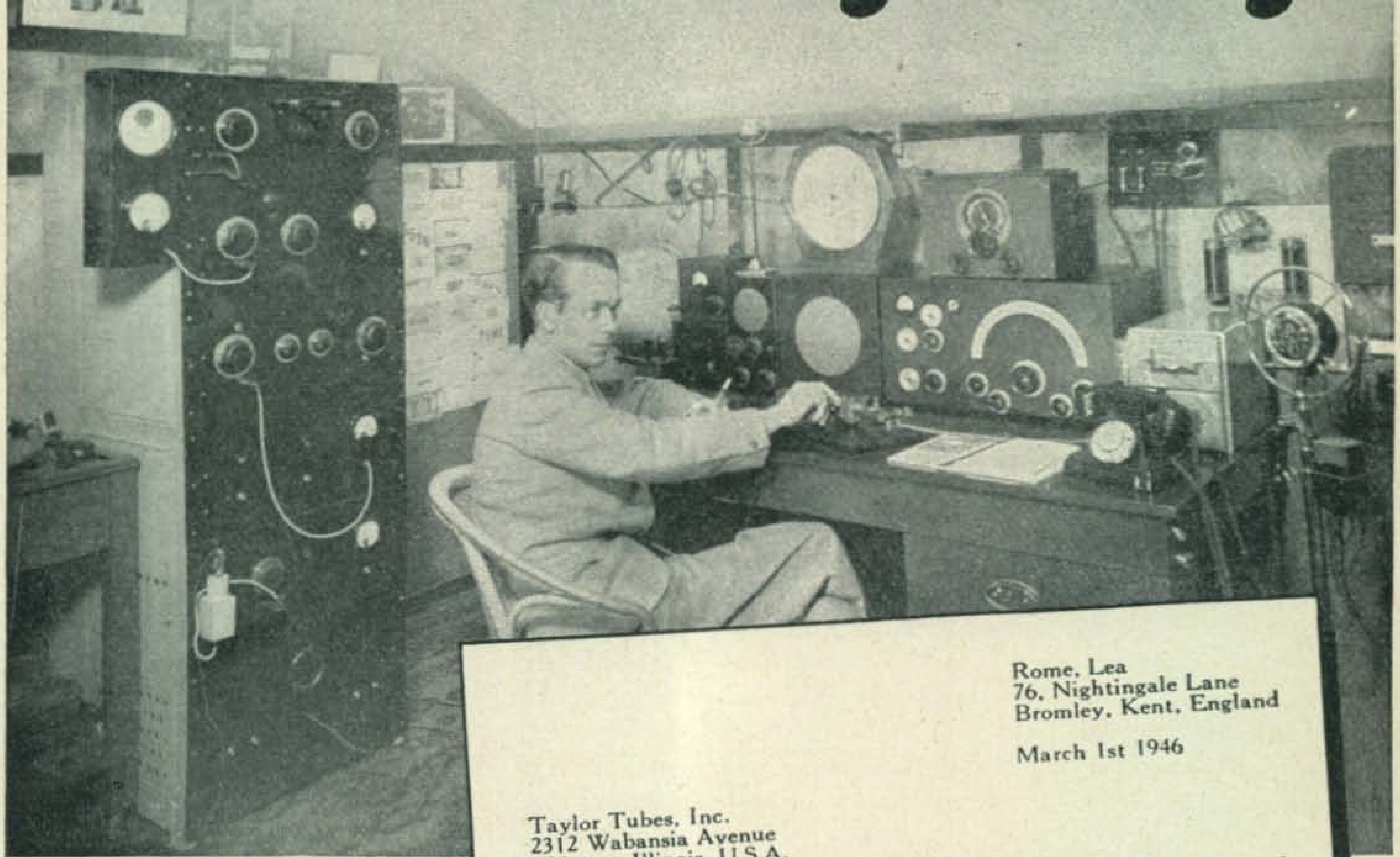
Our reasoning is this—today, in order to obtain a Class B license, it is merely necessary to have a fairly good memory. From available literature, all the thinking is done for the aspiring ham. The result, frequently, is an amateur who gets on the air and promptly forgets everything he memorized. Tacit recognition of this fact is made by the FCC in requiring contacts for renewal of operator's licenses to be on c.w.—although this is a rather difficult rule to enforce. By making this new license relatively simple to obtain, and making it impossible to obtain the higher class B and A without holding the Class D for a year (during which period active operation must be certified) the new ham will learn by doing. Every amateur knows that no amount of book-learning can be substituted for practical knowledge.

Those who feel that any such plan is not feasible from a technical standpoint must not lose sight of the fact that the radio art has progressed to a point where certain minor restrictions can insure reasonable signals even from a novice. A 50-watt power limit with crystal control mandatory might give this special beginner's band a character quite unique in radio.

When the pressure of renewals and new licenses is no longer so great on the FCC, the organized representatives of ham radio might do well to take up such a proposal with the commission. These neophyte hams would certainly want the thrill of DX, so their band should not be on the VHF's. While it may be wishful thinking at the present time, perhaps they could have a medium and a high-frequency assignment of their own. Whether these bands should be open to other classes of license holders is just one of many complexities bound to arise. A possible solution might be to permit operation by anyone provided the power limits of the band were observed.

Amateur ranks are increasing tremendously. The creation of this new license will improve amateur standards. It might also be the means of ultimately adding substantial increases in frequency allocations to the inadequate holdings of the ham. It would certainly lend a helping hand to thousands of veterans who are interested in ham radio, but who do not have friends to help train them to break into the hobby. It is important to remember the multitudes of Americans who do not live in large cities, where the next ham may be miles away. The Class D license should be carefully considered by all hams and potential hams.

Still Going Strong!



Rome, Lea
76, Nightingale Lane
Bromley, Kent, England

March 1st 1946

Taylor Tubes, Inc.
2312 Wabansia Avenue
Chicago, Illinois, U.S.A.

Gentlemen:

I am sure you will be interested to learn of my satisfaction and the grand results I have had with my transmitter using your tubes.

The line-up of the rig is a 6L6 tri-Tet Osc. TZ20 Doubler. T55 P.A. and a couple of TZ20's working in Class B in the modulator. The T55 runs with 1000 volts on the anode at about 80 ma.

Prior to the close down over here in 1939 using the above line-up I had WAC Fone and CW.-WBE Fone and CW gained the British Empire Radio Transmission Award, which is the most difficult of the RSGB awards. I also worked all States in America on Fone and have the ARRL certificate endorsed 4th Station in Great Britain to qualify for this award.

On February 28th I think I established a record in Great Britain for 10 meter DX by working WAC and WBE within 9 hours 30 minutes, as below:

STATION	COUNTRY	MY RST	GMT
W4YA	Burma Rd.	4/6	0822
XU1YQ (W8SJA)	China	6/8	0847
W8CJR	Shanghai	3/5	0852
XU1YK (W2LNQ)	Pekin	5/9	0916
ZS6FN	Johannesburg	5/8	0954
LU4EC	Olivia, S.A.	3/4	1035
G6CU	Cocas Is.	7	1147
G3FJ	Slough Eng.	7	1052
W1IEN	Attleboro, Mass.	9	1737
VE3LC	Ottawa	7	1750

Can you wonder that I write in praise of your tubes most of which I was using in 1937?

I am enclosing a photograph of my station, and if you care to use it with any of this letter you may do so.

Again, congratulations on your outstanding tubes.

C. G. Allen- G8IG

Congratulations, Mr. Allen of England, on a fine performance record. Your splendid operating achievements are a challenge to all amateurs. We are proud that Taylor Tubes played their parts well and that they are living up to their reputation of performance and dependability.

"MORE WATTS PER DOLLAR"

Taylor HEAVY CUSTOM BUILT DUTY Tubes

TAYLOR TUBES INC., 2312-18 WABANSIA AVE., CHICAGO 47, ILL.

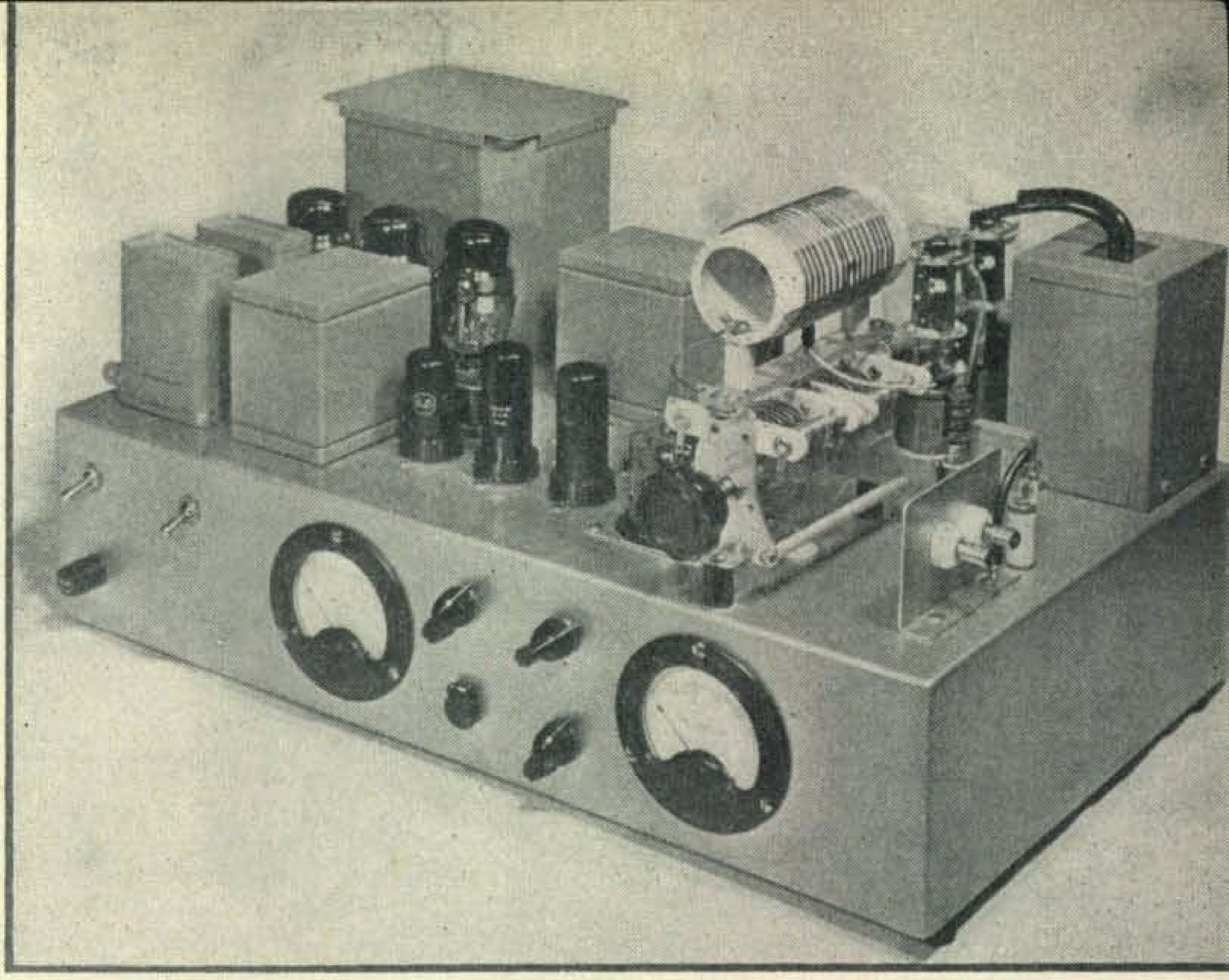


Fig. 1. Complete in every detail, there is still no crowding on the chassis. Careful attention to layout and components selected for minimum physical dimensions contribute to the compact design

A 100 Watt
TRANSMITTER-EXCITER UNIT

DAVID F. LEWIS, W2IYO

A completely self-contained c.w.-phone transmitter capable of operating from 3.5 mc to 144 mc and constructed on one chassis

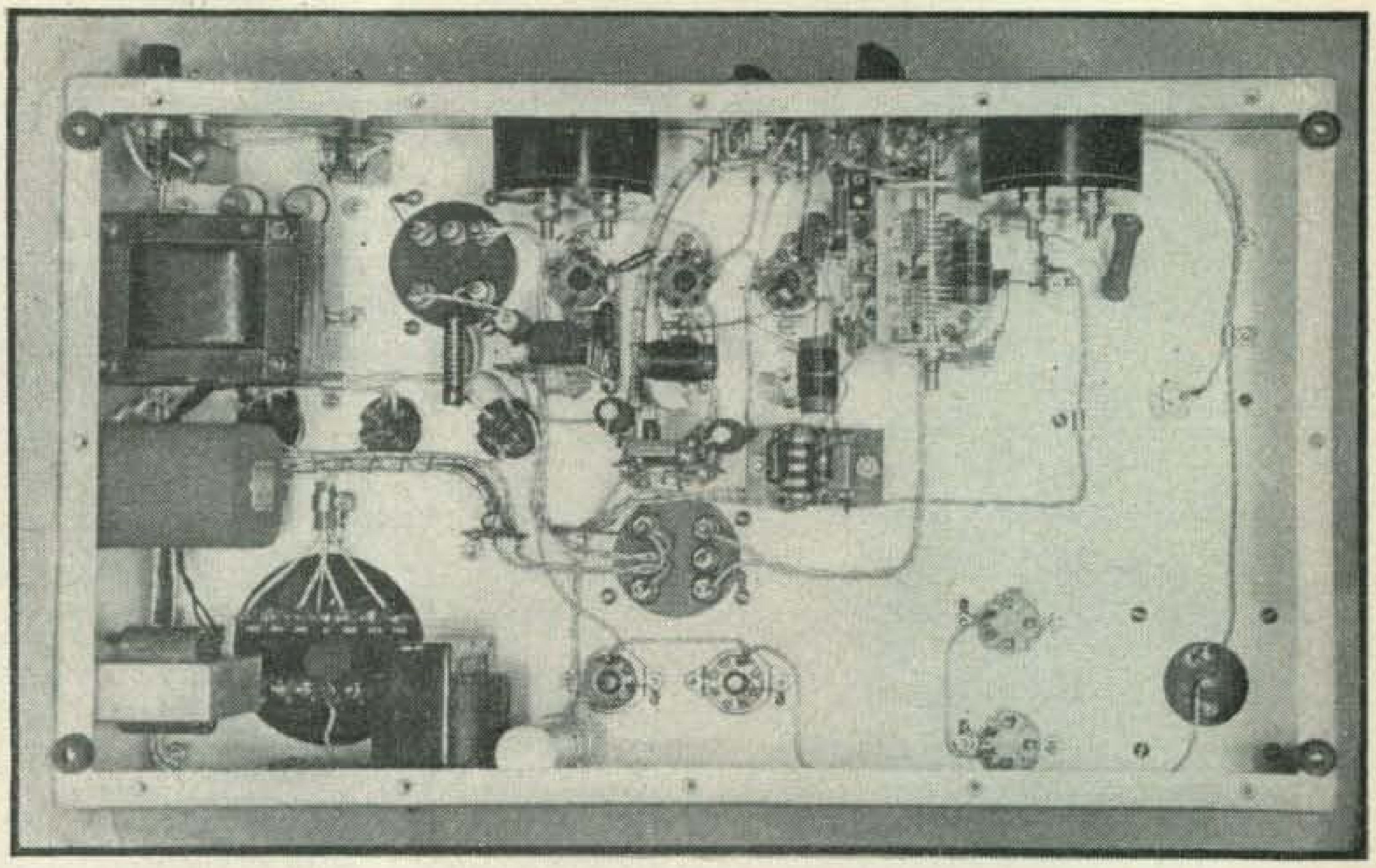
It was the writer's intention for some time to design a completely self-contained c.w.-phone transmitter; a complete job on one chassis rather than many units built separately and connected by a maze of cables and wires. This was to be used for contacts that did not require high power, cutting down on operational costs and reducing unnecessary QRM. The unit had to be capable of supplying sufficient excitation to a triode r-f amplifier running at 1-kw input. The audio section of the transmitter had to furnish excitation for a Class B, 500-watt modulator stage. The latter was to be accomplished by substituting a plate-to-line transformer for the modulation transformer. With this goal in mind, the transmitter herein described was designed and constructed for all-band operation.

The entire unit is constructed on a seam-welded aluminum chassis, 20½″ x 12″ x 4½″. (See *Fig. 1.*) After all drilling and punching operations are completed the chassis is sprayed with a fine-grained aluminum paint, which covers all blemishes and marks on the chassis and gives the appearance of a fine, caustic-dipped finish. The paint used was Maas and Waldstein's Silver Metalustre #2, sprayed with an ordinary insecticide gun.

As can be seen from the schematic, four r-f stages are used. The second 6V6 stage may be eliminated should operation on only two or three bands be required. As the 829B power amplifier stage can be operated up to 200 mc at full output, an extra stage for frequency multiplying to the VHF'S is incorporated.

Meter switching was decided upon as the least expensive method of metering all grid and plate circuits. This was accomplished with two single-wafer rotary switches, contact details of which are shown on the schematic.

Terminal-board construction was used as much as possible in order to reduce point-to-point wiring to a minimum. This method of construction results in a much neater wiring job plus excellent anchorage for all components. What point-to-point wiring was used was done in



Under chassis view of transmitter. By observing best engineering practices good efficiency is obtained down to 144 mc

the interest of obtaining the shortest possible r-f leads. All wire used was of the glass-braided type. Color coding was adhered to in order to make circuit tracing easy.

Power Supply

Dual rectification is used in the power supply. A 500-ma plate transformer delivering 580-530-300 volts, a.c., each side of center, is used in conjunction with three CK-1006 hot-cathode, gaseous rectifiers to deliver the two required d-c voltages, 500 and 250 volts. Dual rectification was chosen as the best method of obtaining the 250 volts needed for the r-f exciter and audio-driver stages and the screens of the 807 modulators. This method eliminates the conventional series-dropping resistors plus the poor regulation and power wastage they afford.

The plates of two of the rectifiers are tied together and used as half-wave rectifiers for the 580-volt taps on the plate transformer. The third is utilized as a full-wave rectifier for the 300-volt taps. The CK-1006 tubes were selected because the tube voltage drop is only 20 volts at their maximum current rating of 200 ma, as compared with 60 to 80 volts for vacuum-type rectifiers. Physically the CK-1006 is much smaller than vacuum rectifiers of the same current and peak inverse voltage rating. A definite advantage of this tube is its ability to operate very satisfactorily as a cold-cathode rectifier, hence no filament transformer is required. The writer, however, used the tubes as hot cathode rectifiers, as primary keying when operating c.w. was desired. The slight delay in ionization of the gas when operating cold does not allow satisfactory high-speed keying. Should only phone operation be desired the filaments may be operated cold with very satisfactory results.

The filament rating of this tube is 1.75 volts at 2.25 amperes. This was obtained by rewinding the secondary of a 5-volt open-frame transformer for 1.75 volts. For the filaments of the two half-wave rectifiers a 2.5-volt transformer was used with a .17 ohm resistor to drop the voltage to 1.75. The resistor was made by winding nichrome wire on a 10-watt resistor. Choke input is used in both filter networks as an aid to good regulation because the modulator tubes are operated Class AB2. The plate transformer primary is fused as a protection against secondary shorts.

Crystal Oscillator

A 6J5 is used as a Pierce oscillator and performs nicely with crystals of all frequencies. A 20-$\mu\mu$f condenser connected between cathode and grid provides enough r-f plate voltage feedback to sustain oscillator operation when using low-frequency crystals. If crystals with fundamental frequencies of 7 mc or higher are used it may be eliminated entirely with a slight decrease in r-f crystal current. Plate voltage is obtained directly from the 250-volt supply. Plate voltages higher than 250 volts are not recommended because excess r-f crystal current may fracture the crystal. If the voltages and components specified are used, the d-c plate current should not exceed 9 ma.

Doubler-Quadrupler Stage

A 6V6 capacitively coupled to the oscillator is utilized as a doubler-quadrupler stage. In this case it is used as a regenerative doubler to 20 meters. If 10-meter operation is wanted it quadruples very easily and furnishes sufficient excitation to the following stage. A 2.5-ma choke in parallel with a 250-$\mu\mu$f condenser is used in series with the cathode to obtain regeneration. Plate and screen voltages are taken directly from the 250-volt supply. The d-c plate current runs about 20 ma with the stage loaded.

Buffer Amplifier

A second 6V6 capacitively coupled to the doubler-quadrupler stage is used as a straight amplifier for 20-meter operation. If 5-meter operation is desired, it may be used as a doubler provided the preceding stage is used as a doubler to 10 meters. Should 2-meter operation be your objective the preceding stage may be operated as a quadrupler to 36 mc and this stage as a quadrupler to 144 mc. Sufficient excitation to the power amplifier can be obtained with any desired combination.

Due to an excess of drive from the preceding stage, the 6V6 is operated with high grid bias in order to reduce the grid current to 2 ma. Even though this stage is operated with high bias it was found necessary to reduce the screen voltage to 100 volts in order not to over-drive the power amplifier stage. With the plate current loaded to only 15 ma, full excitation is supplied to the 829B through link coupling. Polyethylene insulated wire is used for the coupling, one turn on each end. Neutralization was found to be necessary when operating the 6V6 as a buffer amplifier. This was obtained by connecting a piece of polythylene insulated wire to the cold end of the plate coil and twisting one turn around the grid wire. This small amount of coupling supplies just enough out-of-phase voltage feedback to neutralize the stage. It is not necessary to readjust the neutralizing when changing frequency from one end of the band to the other. It may also be left alone when operating the stage as a doubler or quadrupler.

Power Amplifier

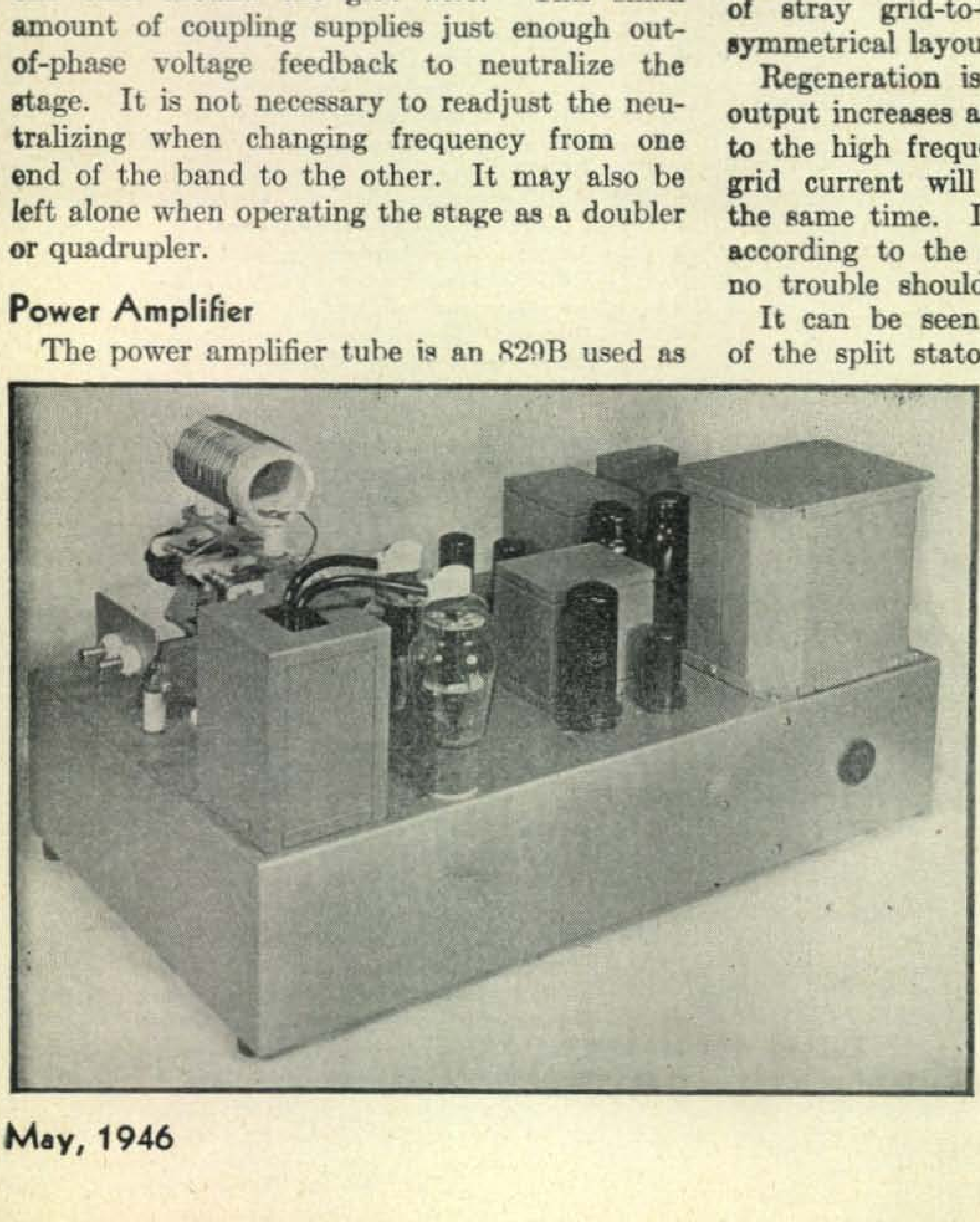
The power amplifier tube is an 829B used as a push-pull amplifier. This tube was selected because of the high output available (80 watts) with relatively low plate voltage and extremely low excitation (0.7 watts), plus the advantage of being able to operate it at full input up to 200 mc.

Care should be exercised when laying out this stage. It is important that the amplifier layout be symmetrical. Keep r-f leads as short as possible. The two grid leads should be of equal length, as well as the two plate leads. Both grid and plate coils should be tapped at their exact electrical centers in order to obtain equal balance in the grid and plate circuits. Input and output couplings should be symmetrical. Unless equal mechanical and electrical symmetry is maintained it may be be difficult to obtain equal loading of both sections of the tube.

When wiring this stage it is important that the screen by-pass condenser be connected as closely to the screen terminal as possible. The ground side of this condenser should be connected directly to the cathode terminal. This is necessary as insurance against self-oscillation or regeneration. When using high-power-sensitivity tubes such as r-f pentodes and tetrodes, regeneration is easily introduced as a function of stray grid-to-plate-coupling or from unsymmetrical layout.

Regeneration is evident when the amplifier output increases as the tank condenser is tuned to the high frequency side of resonance. The grid current will show a marked increase at the same time. If the amplifier is constructed according to the suggestions previously given, no trouble should be experienced.

It can be seen from *Fig. 2* that the rotor of the split stator tank condenser is left un-



Back of chassis showing layout of speech and modulator stages. 110 a.c. is brought in through plug on right hand side of chassis

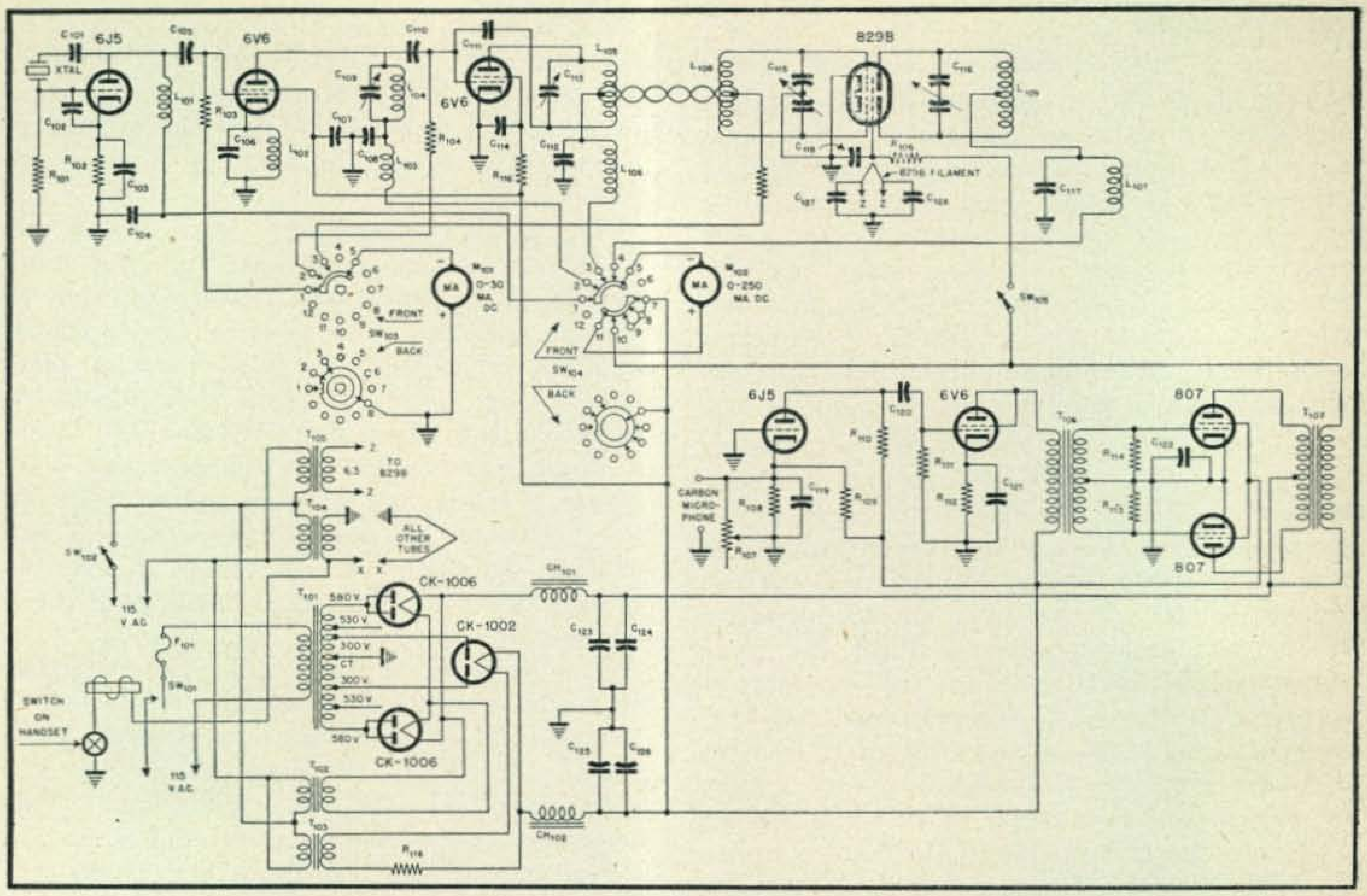


Fig. 2. The circuit diagram of the 100 watt transmitter-exciter

C101—.004 μf, mica, 500 volts, ±20%
C102—20 μμf, mica, 500 volts, ±10%
C103—.001 μf, mica, 500 volts, ±20%
C104—.001 μf, mica, 500 volts, ±20%
C105—240 μμf, mica, 500 volts, ±10%
C106—240 μμf, mica, 500 volts, ±10%
C107—.001 μf, mica, 500 volts, ±20%
C108—.001 μf, mica, 500 volts, ±20%
C109—100 μμf, variable, APC type
C110—240 μμf, mica, 500 volts, ±10%
C111—Neutralizing condenser (*see text*)
C112—.001 μf, mica, 500 volts, ±20%
C113—100 μμf, variable, APC type
C114—.001 μf, mica, 500 volts, ±20%
C115—Split stator midget, 15 μμf per section
C116—Split stator .144 spacing, 20 μμf per section
C117—.001 μf, mica, 500 volts, ±20%
C118—.001 μf, mica, 500 volts, ±20%
C119—.1 μf, tubular paper, 200 volts, ±25%
C120—.05 μf, tubular paper, 400 volts, ±25%
C121—10 μf, electrolytic, 25 volts, +25%–10%
C122—20 μf, electrolytic, 50 volts, +25%–10%
C123—4 μf, oil-filled, 600 volts, +25%–10%
C124—4 μf, oil-filled, 600 volts, +25%–10%
C125—10 μf, electrolytic, 450 volts, +25%–10%
C126—10 μf, electrolytic, 450 volts, +25%–10%
C127—.001 fμ, mica, 500 volts, ±20%
C128—.001 μf, mica, 500 volts, ±20%
Ch101—4h, 400 ma, 2000 volt insulation
Ch102—15h, 200 ma, 1500 volt insulation
F101—3 amps., type 3 AG fuse
L101—2.5 mh choke, 125 ma
L102—2.5 mh choke, 125 ma
L103—2.5 mh choke, 125 ma
L104—14 mc doubler tank coil
L105—14 mc buffer tank coil
L106—2.5 mh choke, 125 ma
L107—2.5 mh choke, 300 ma
L108—P.A. grid coil, 14 mc
L109—P.A. plate coil, 14 mc
R101—240,000 ohms, carbon, ½ watt, ±20%
R102—510 ohms, carbon, ½ watt, ±10%
R103—51,000 ohms, carbon, ½ watt, ±10%
R104—100,000 ohms, carbon, ½ watt, +20%
R105—5600 ohms, carbon, 1 watt, ±10%
R106—7000 ohms, wire-wound, 10 watt, ±10%
R107—1000 ohms, wire-wound control, audio taper
R108—10,000 ohms, carbon, ½ watt, ±10%
R109—24,000 ohms, carbon, 2 watt, ±20%
R110—51,000 ohms, carbon, ½ watt, ±20%
R111—240,000 ohms, carbon, ½ watt, ±20%
R112—400 ohms, carbon, 1 watt, ±10%
R113—10,000 ohms, carbon, ½ watt, ±10%
R114—10,000 ohms, carbon, ½ watt, ±10%
R115—250 ohms, wire-wound, 20 watts, ±10%
R116—100,000 ohms, carbon, ½ watt, ±20%
R117—.17 ohm, wire-wound (*see text*)
Sw101—SPST relay, 6V. a-c coil 1/4" contacts
Sw102—SPST toggle switch, 3A, 125V.
Sw103—Single wafer rotary switch, 1 pole, 3 position with back contacts and shorting ring (Grid current meter Sw.)
Sw104—Single wafer rotary switch, 2 pole, 4 position with back contacts and shorting ring (Plate current meter Sw)
Sw105—Single wafer rotary switch, SPST, (829B Screen Sw)
T101—Plate transformer, 105, 115, 220, 230 volt primary 580, 530, 300 volts each side of center at 500 ma (U.T.C. #PA-301)
T102—CK-1006 filament transformer, 1.75 volts, 5 amps.
T103—CK-1006 filament transformer, 1.75 v., 2.5 a.
T104—Filament transformer, 6.3 volts, 6 amps.
T105—Filament transformer, 6.3 volts, 3 amps.
T106—Driver transformer, 6V6 to P.P. grids
T107—Class AB2 modulation transformer, 4500 ohms primary to 2500 ohms secondary

grounded. This can be done only when the amplifier is absolutely symmetrical. This has the advantage of allowing a condenser of less spacing to be used as there is no d.c. across it. Should it be found difficult to accomplish equal loading of the stage using this method, the rotor will have to be grounded through a mica condenser.

Screen voltage for the 829B is obtained from the 500-volt supply through a series dropping resistor. Plate voltage is taken directly from the 500-volt supply. Minimum plate current at reasonance is about 10 ma. With the stage fully loaded the plate current is 200 ma at 500 volts or 100 watts input. The amplifier efficiency runs about 80% or slightly higher. Care must be taken not to allow the grid current to exceed 15 ma.

Speech Amplifier

It was decided to use an F3AW3 Western Electric handset with push-button control for relay operation. As this handset contains an F1 carbon microphone, the speech amplifier stage was designed accordingly. As can be seen from *Fig. 2*, a 6J5 tube is used with the grid at ground potential and the microphone connected across the cathode resistor. As the cathode current of this stage is not of sufficient amplitude to energize the carbon mike, a 25,000-ohm, 2-watt resistor is connected from the cathode to the 250-volt supply. This bleeds enough current though the microphone to completely energize it. This system eliminates the usual microphone transformer and battery for mike voltage.

It makes an ideal microphone amplifier for high-frequency mobile transmitters where size and weight must be kept to a minimum.

Plate voltage for this stage is obtained through a 51,000-ohm plate-loading resistor from the 250-volt supply.

Driver Stage

A 6V6, triode connected, is resistance-coupled to the 6J5 speech amplifier and is used as a driver for the modulator tubes. Plate and screen voltages are obtained from the 250-volt supply. Sufficient gain is realized to drive the modulators to full output.

Modulators

Push-pull 807 tubes, transformer-coupled to the 6V6 driver stage, are used as modulators. Operating in Class AB2, they deliver 60 watts of audio which modulates the 829B 100% at 100 watts input. Zero signal plate current should run about 100 ma, and 200 ma with maximum signal input. As there is enough audio power to overmodulate, it is advisable to adjust the modulator for 100% modulation by the proper setting of the speech amplifier gain control. An oscilloscope, if one is available, is recommended for this operation. Plate voltage for the 807 tubes is obtained directly from the 500-volt supply. Screen voltage is taken directly from the 250-volt supply.

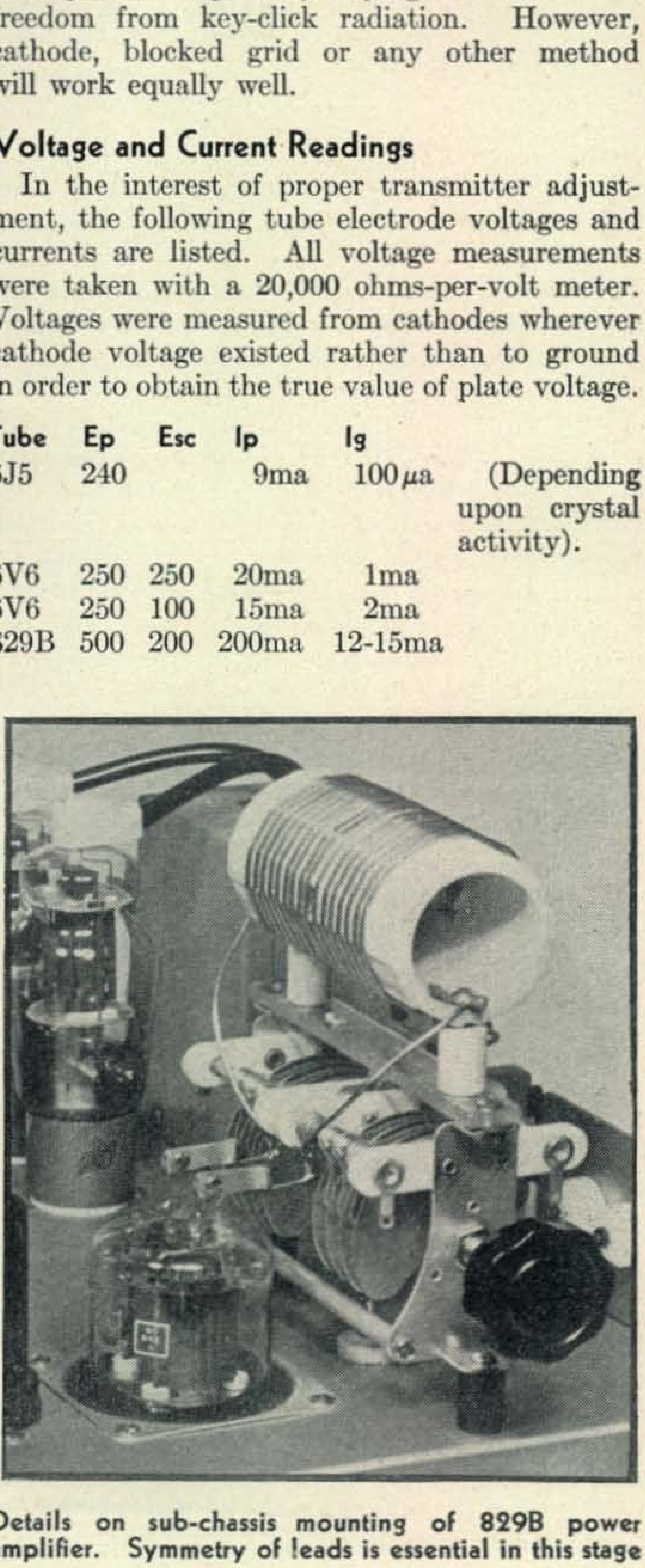
Keying

Because every ham has his own pet method of keying a transmitter, no particular type or method is suggested. The writer has always been partial to primary keying because of the freedom from key-click radiation. However, cathode, blocked grid or any other method will work equally well.

Voltage and Current Readings

In the interest of proper transmitter adjustment, the following tube electrode voltages and currents are listed. All voltage measurements were taken with a 20,000 ohms-per-volt meter. Voltages were measured from cathodes wherever cathode voltage existed rather than to ground in order to obtain the true value of plate voltage.

Tube	Ep	Esc	Ip	Ig	
6J5	240		9ma	100 μa	(Depending upon crystal activity).
6V6	250	250	20ma	1ma	
6V6	250	100	15ma	2ma	
829B	500	200	200ma	12-15ma	



Details on sub-chassis mounting of 829B power amplifier. Symmetry of leads is essential in this stage

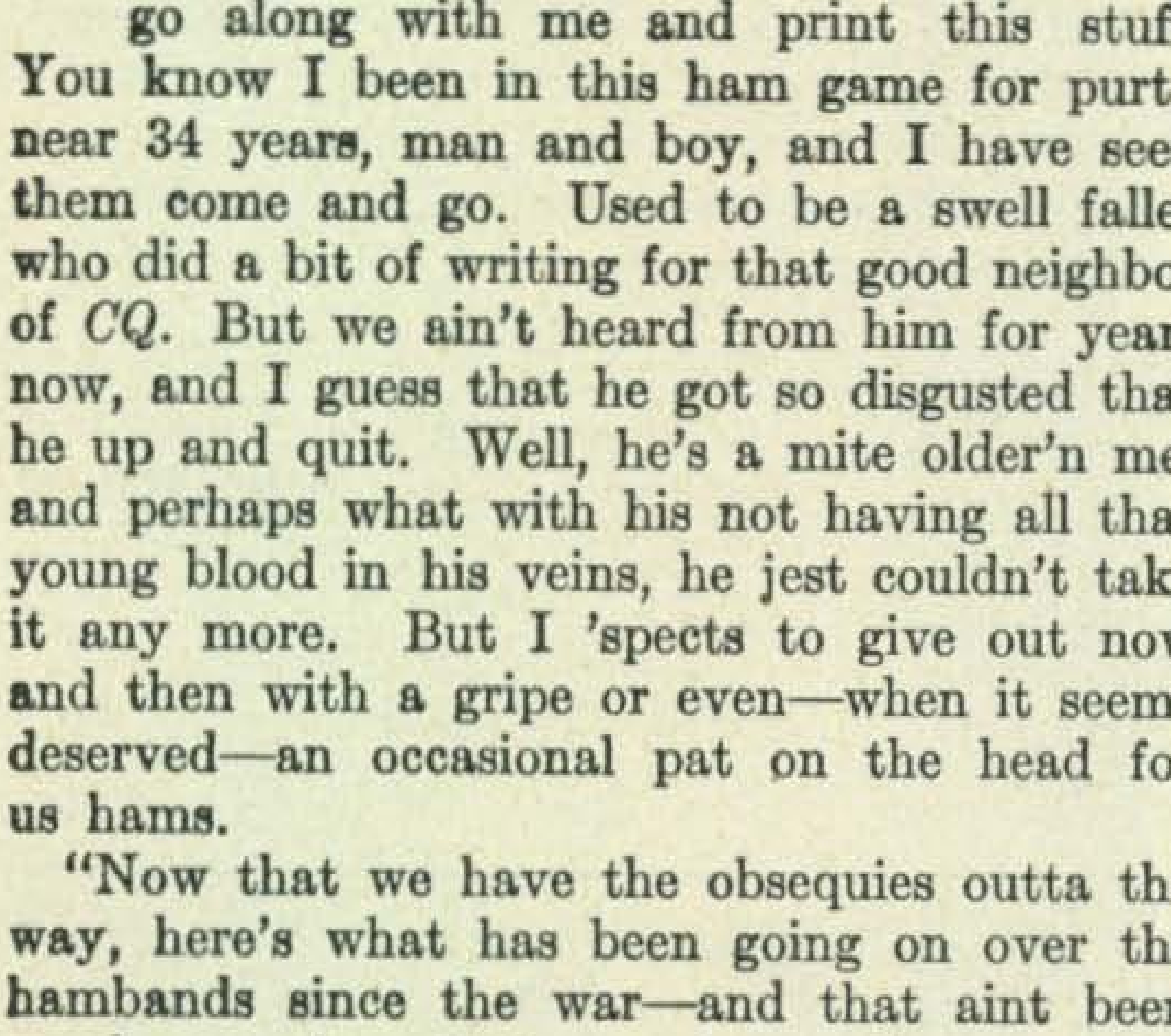
The War Ain't Changed the Ham a Bit

by The Old Timer

"SAY, Mister Editor, you being a new ham magazine and all that, I hope you will go along with me and print this stuff. You know I been in this ham game for purty near 34 years, man and boy, and I have seen them come and go. Used to be a swell faller who did a bit of writing for that good neighbor of *CQ*. But we ain't heard from him for years now, and I guess that he got so disgusted that he up and quit. Well, he's a mite older'n me, and perhaps what with his not having all that young blood in his veins, he jest couldn't take it any more. But I 'spects to give out now and then with a gripe or even—when it seems deserved—an occasional pat on the head for us hams.

"Now that we have the obsequies outta the way, here's what has been going on over the hambands since the war—and that aint been much over three little measly months.

"Have you guys heard that fellow with the



beam who is running a 'Call me but I don't answer if I've talked to you before' contest? Nice feller. He don't remember back to the days when he put his first rig on the air now, does he? An old DX hound, that's what he claims to be, and there's nothing I can say about that. All of us like to be DXers now and then. But the oldest underlying attribute of the ham has always been to help his fellow ham. Does that mean anything to this gink? Nossir! He'll let you call your fool head off, and if you're not far away—well, his ears jest don't hear you. Seems to me he ought at least to give you a shout and ask if there's anything he can do fer you. Might be able to help you put your rig in better condition or something. Like as not you'll be glad to make it a very short QSO if you find he's DXing for the night.

"But catch that same guy when someone is over to his shack! My, oh my what a difference!

Then he'll talk to anyone and yateka, yateka yateka until your ears are about ready to drop off. How's his rig sound? Can you understand the baby wailing in the background? He's running umty ump watts to a peanut tube and the receiver has blah blah tubes in a superduper heterodyne! Nuff to give your stomach a twist!

"Seems to me that aint quite fair and that things ought to be more even on the give and take side.

"Then there's that goop in that big eastern city running kilowatt to a skyhook placed squarely in the middle of a lot of BCL antennas. He's a returned vet. So far the neighbors have not had the heart to bring him to task for the uproarings and squawks that emanate from that rig of his. They have not said a dangdang thing about their lights dimming every time he throws the big switch. They think that he's entitled to some fun while he gets the blood and smell of the foxhole out of his system.

"This particular bird takes great delight in telling blood-curdling stories on the air of what he 'saw' and heard in the Big Fight. Some of the persons who are forced to listen in have had sons fathers in the war who are never coming back. Naturally they listen avidly for the chance that a stray mention might be made of their loved ones. Yet all the time they are horrified at the gruesomeness of the tales they hear.

"And, Mister Editor, here's the payoff. The gink was never across the Big Pond and all his stories are jest so much imagination. Seems to me that he would stop telling that sort of rot over the air and—more to the point—he would do something about respecting the feelings of others. He might cut his power during the normal BC listening hours and keep off the air when the Sunday series of laugh shows arrive. Furthermore he's giving the ham frat a rotten name all because he can hide behind a mike and no one knows who he really is or what he looks like. Guys like that give me swift pain in the neck,—and that's moving them up considerable!

"How about that mike hound down West way. Hogs the band for hours and hours on end with nonsensical drivel which is supposed to pass for radio engineering. With a signal that takes up almost the whole 10-meter band from end to end, he jaws about thisa and thata from morning to way past bed time. Funny thing, if you listen long enough you might realize that he don't know any more about radio than your Aunt Hetty. He thinks a space charge is what you pay for having your advertisement run in *CQ*! That he don't know beans about radio is excusable. We all have to learn. But does he have to hold forth by the hour and hold up everyone in his neck of the woods because they are not able to pull through any stations while his carrier hogs the air?

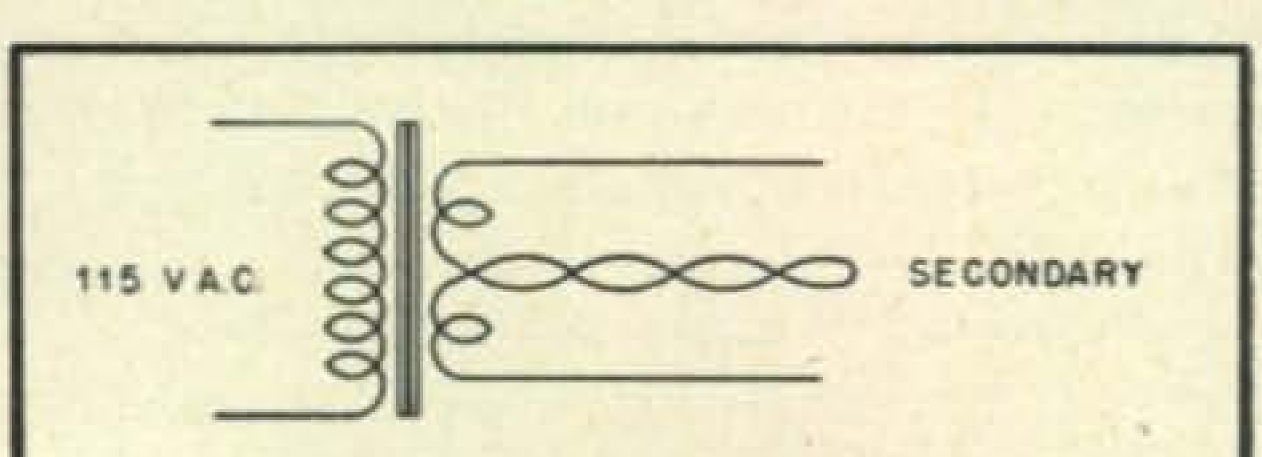
"But the best gripe of the lot is about that prexy of that radio company. He does a fine selling job on the air. He's the prexy of the so-and-so co. he says, We make everything from soup to nuts, he orates. Nobody makes anything better than we, he howls. What a lot of hog-wash. Seems to me that the ham bands should not be used for sales meetings, and certainly not for commercial enterprises. He's also giving us the black eye.

"And, Mister Editor, I'd like to close this little letter with a real legal-like gripe. In a part of the country a guy with a ham op's license but no station ticket is using other ham's call letters. One ham got on the air and so he had to find another one. Things is that he always uses the call letters of ham how—believe it or not—gives him permission to do it. While this is strictly against the law, so the local RI tells me, the hams are actually helping him to break it. Then those same hams will pop up later with a gripe that the bootleggers are great guns in their parts, and why does'nt Uncle Sambo send the FBI, the Army, the Navy and a whole lot of cops to root them out? Seems to me that there's enough trouble with *legitimate bootleggers* without the hams creating more illegal operating.

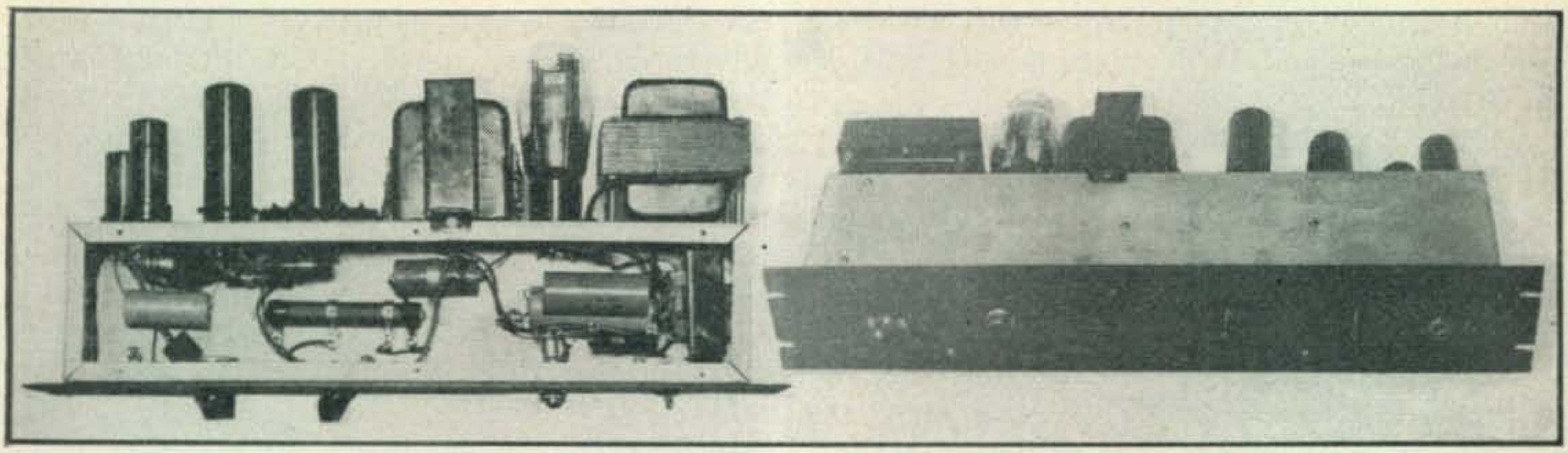
"Well, I had my say. . . . . What do you think?

Embarrassing Moments

Once in a while you may run across a filament transformer with the center tap brought out as shown in the sketch—if so, watch out! I once built an amplifier using such a transformer, grounded one side of the heater circuit and blithely clipped the center-tap lead short. No, the heater circuit wasn't wide open—that would have been too easy. It was intermittent, and I had quite a session before the light dawned. Moral: Look before you clip! W1NVO/W2ESO.



Link center-tapped secondary



Reduced audio requirements when cathode modulating make possible this compact unit. PP 6L6's will handle r-f amplifier inputs up to 500 watts. There is no crowding on the 4" x 3" x 17" chassis which includes three audio stages and power supply

A Simple CATHODE MODULATOR

FRANK C. JONES, W6AJF

W6AJF has long been one of the principal proponents of cathode modulation. This simple, compact unit will cathode modulate almost any rig, small or large, up to 500 watts input

WITH SLIGHT MODIFICATIONS almost any c.w. transmitter may be cathode modulated for phone operation. The unit illustrated here was built for use with a low or medium powered c. w. transmitter.

Basic Forms of Modulation

Basically there are two main forms of amplitude modulation, one in which the input power is varied in amplitude and the other in which the operating efficiency of the Class C amplifier is varied. Suppressor grid and control grid modulation are familiar forms of the latter, and plate modulation is the common form of the first type. Cathode modulation is a combination of efficiency and power supply modulation. The audio power is connected in series with the cathode (filament center-tap) of the r-f Class C final amplifier. In this position, part of the audio voltage produces plate modulation and part of it acts on the r-f tube grid circuit to produce grid or efficiency modulation. The percentage allotted to each circuit depends upon the amount of audio power available and this factor permits a small audio power amplifier such as a pair of 6L6 tubes to be used with most r-f amplifiers even for power inputs up to 500 watts. As is well-known, 100% plate modulation requires peak audio power equal to the d-c input to the modulated Class C amplifier and, for sine-wave input, average audio power equal to half the d-c input to the modulated stage. In this case, the r-f tube grid is driven hard to obtain high carrier efficiency in the modulated r-f amplifier. The modulator furnishes the side band power requirements since it is connected in series with the d-c plate supply.

Grid modulation (in its simplest form) requires that the carrier efficiency, with no modulation, be half as high as at the peak of modulation. This is normally accomplished by reducing the r-f grid exciting voltage. The a-f modulating voltage is connected in series with the d-c grid bias source, and so varies the operating efficiency of the modulated r-f amplifier. The low carrier efficiency results in relatively low output as compared to plate modulation.

Cathode Modulation

Cathode modulation is a compromise between the two systems. If enough a-f power is available the amount of a-f voltage applied to the grid can be reduced to zero and cathode modulation becomes in effect plate modulation. At the other extreme, if all of the a-f voltage available is applied to the grid as well as the plate return circuit, the degree of grid modulation is high and amount of plate modulation is low. The carrier efficiency in the later case is less, the audio power requirements are less, and the grid r-f excitation must also be lowered.

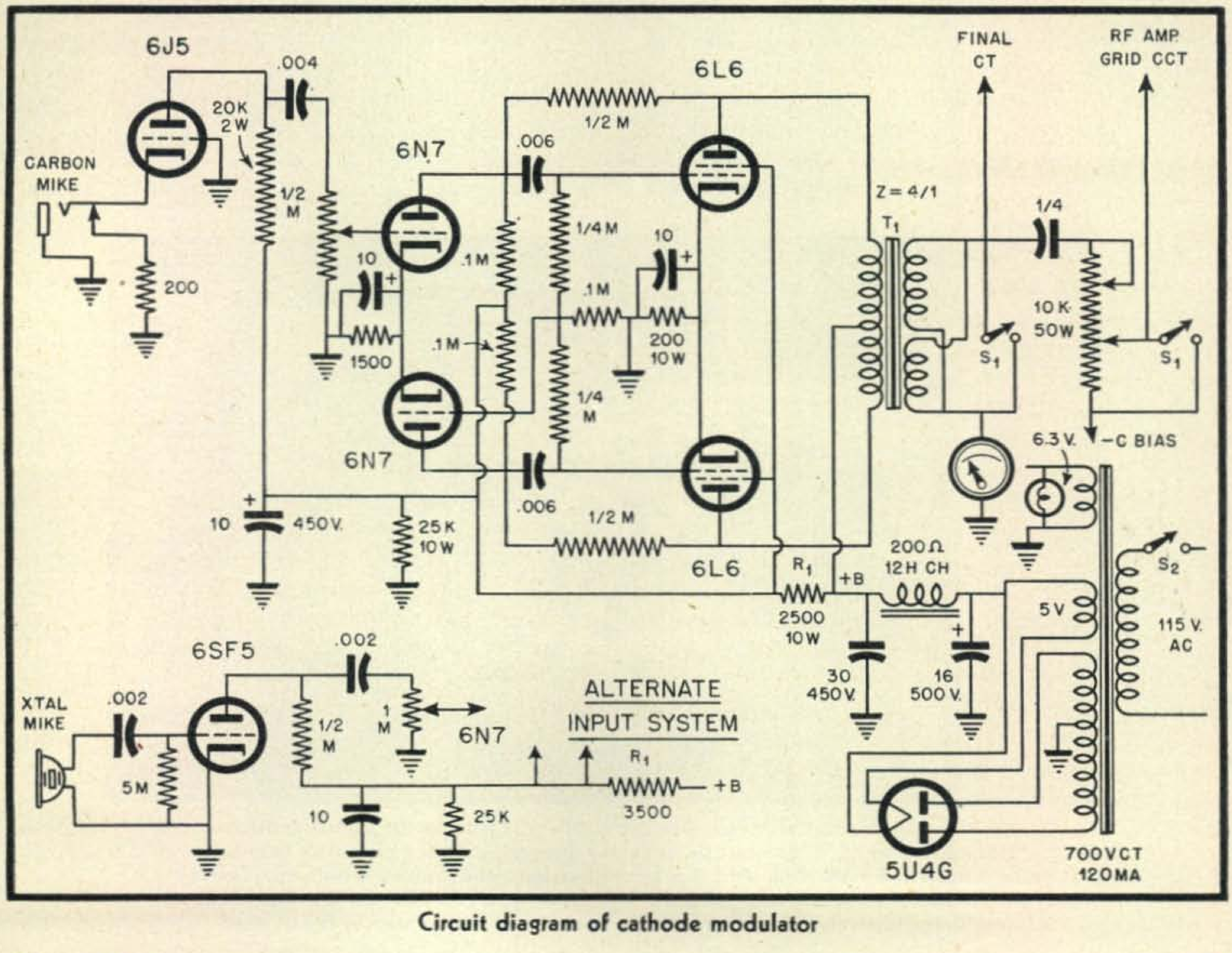
The cathode load impedance presented to the modulator depends upon the ratio of a-f voltages actually applied to the grid and to the plate of the r-f tube. If the grid bias is from a C bias supply with little or no a-f impedance, and the grid returns to ground (not to CT), then the full voltage is applied to the grid and the cathode impedance is low, ranging between 100 and 1000 ohms for different tubes or pairs of tubes. As less a-f voltage is applied to the grid, less audio degeneration takes place in the cathode of the r-f stage and the cathode impedance increases, becoming equal to the plate circuit impedance when no a-f voltage acts on the grid. The percentage of grid modulation can be varied by bringing the grid return to a tap on the modulation transformer instead of connecting it to ground. Another method consists of using grid leak bias of higher than normal value and letting it automatically act as a voltage divider with the grid internal impedance, to reduce the actual a-f voltage on the grid. A combination of these two methods is also possible and is used in the unit shown here.

Constructing a Cathode Modulator

The push-pull 6L6 or 6L6G tubes in this unit were connected to the cathode lead and grid return lead through an output transformer and resistor network to permit easy adjustment for optimum modulation conditions. The transformer can be one designed for 6L6 tubes to match into any cathode load or it can be a heavy duty Class B driver transformer having push-pull primary and secondary windings. The one shown in the photograph had a split secondary and these two windings were connected in parallel in order to obtain a 2- to -1 turns ratio or 4- to -1 impedance ratio. The cathode load (of perhaps 1500 ohms) then looks like 4 times this to the 6L6 plates, a condition satisfactory for good output. Some inverse feedback was used in the 6L6 tubes to minimize plate load impedance variations due to the cathode load.

The transformer must have heavy enough wire and suitable core gap to handle the d-c current of the r-f stage in the secondary without saturation or possibility of burning out.

The d-p-s-t switch in the modulator output was included in order to be able to use the transmitter for either full output on c.w. or reduced output on phone service. Usually the r-f grid drive must be reduced for phone operation, and the actual carrier may be considerably less than half as much as on c.w. The r-f grid drive can be adjusted by varying link coupling to the tuned final amplifier rid circuit. The antenna coupling should be fairly tight for best modulation linearity, especially if a large r-f amplifier is being modulated. [*Continued on page 54*]



Circuit diagram of cathode modulator

Converting the SCR-274-N

L. W. MAY, Jr., W5AJG-W5JKM

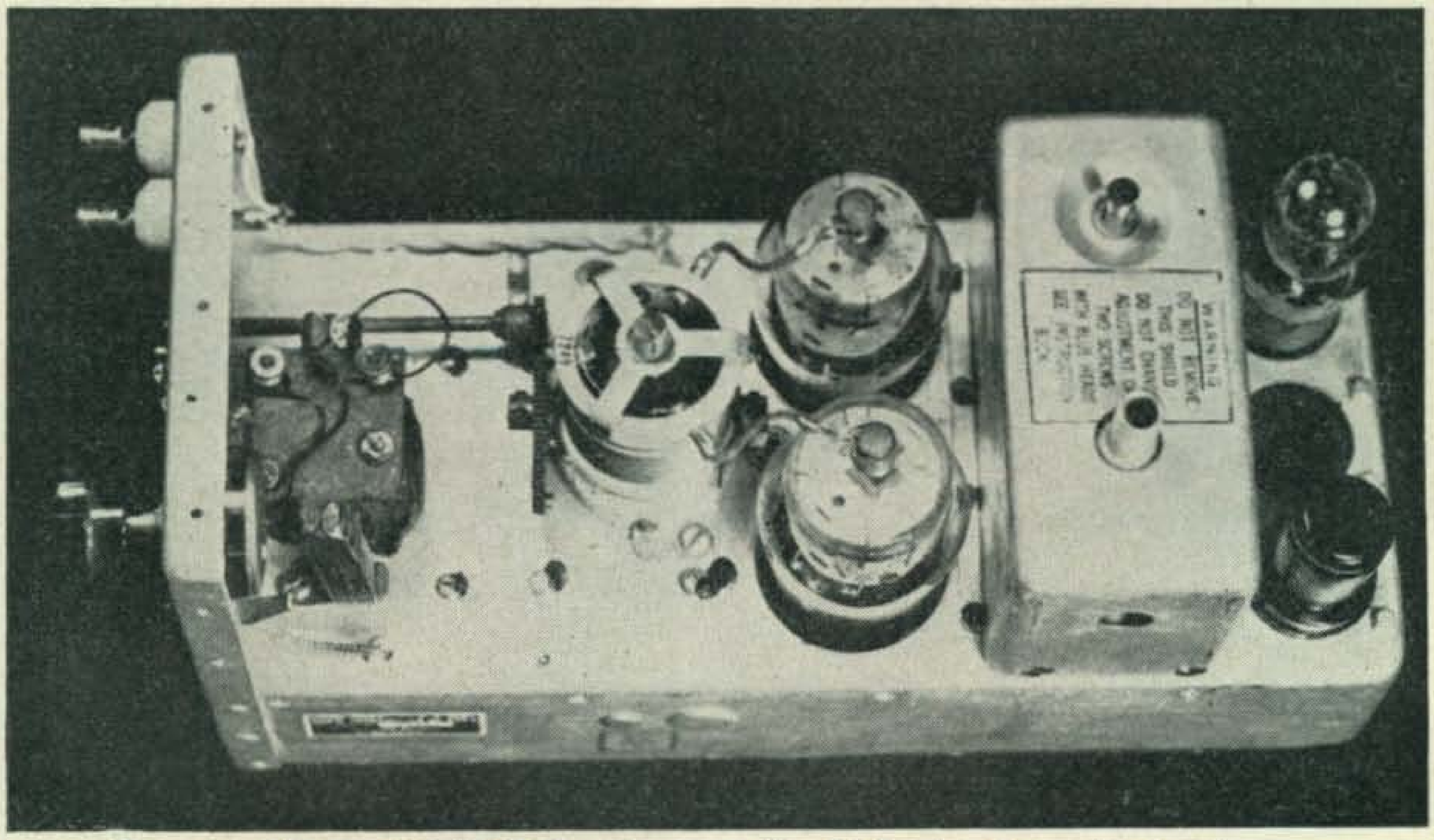
Demobilizing the army unit for variable-frequency control on amateur AM and FM Operation

An increasing amount of surplus Army equipment is appearing on the civilian market. Among various items of interest to the radio amateur is the SCR-274-N, an aircraft unit that is very easily adapted to amateur use as a stable, variable-frequency oscillator (VFO), either for AM or FM operation. The SCR-274-N is the overall designation given the principal components of a multi-channel aircraft radio receiving and transmitting set-up used on thousands of planes and now "declassified." So that the reader may know what to look for, the army numbers of the equipment are as follows:

The receiving end consists of three separate units—the BC-453-A (190-550 kc), the BC-454-A (3.0 to 6.0 mc) and the BC-455-A (6.0 to 9.1 mc). These receivers operate from the airplane 24-28-volt storage battery and each contains a separate dynamotor for plate power. It is an easy matter to substitute 6-volt tubes for the 12-volt series type originally in the receiver, and rewire the filament string for parallel 6.3-volt operation from a standard filament transformer. (Alternatively, a 24-volt transformer may be used to energize the heater circuits with the receiver left as is.) Any light 250-volt receiver power supply will provide plate power for the sets, or a vibrapack may be used if mobile operation is contemplated. These receivers are very sensitive, incorporating an r-f stage, BFO for c.w. reception, and, all-in-all, make excellent receivers up to approximately 10 megacycles.

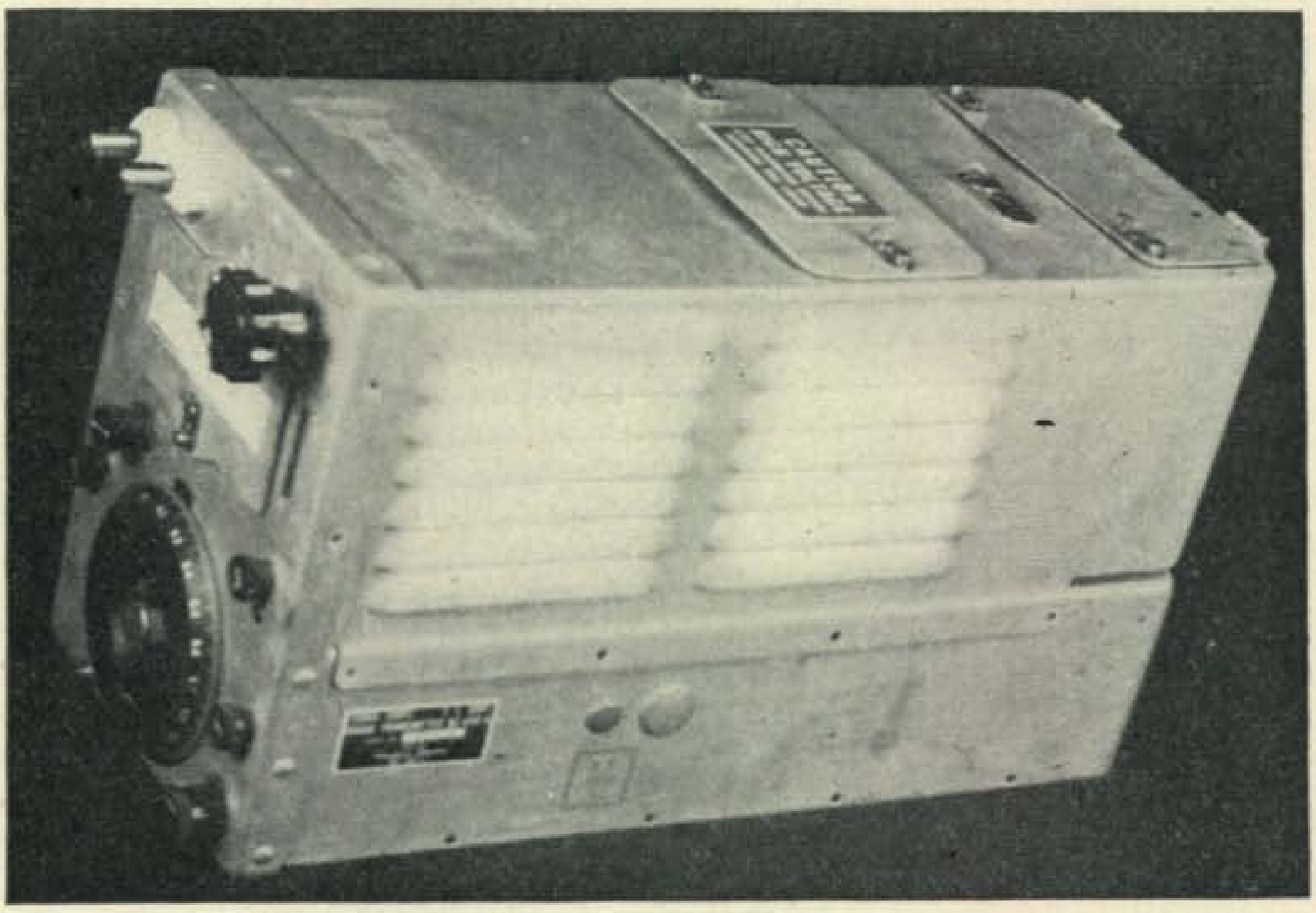
The Transmitters

Four separate transmitters are included in the sending unit. The BC-696-A covers 3 to 4 mc, the BC-457-A from 4 to 5.3 mc, the BC-458-A, 5.3 to 7 mc, while the BC-459-A tunes from 7.0 to 9.1 megacycles. Each transmitter consists of a master oscillator tube (1626 or 12J5) exciting a



Top view of completed VFO with cover off. At front is the audio transformer (500 ohms input) Next can be seen the power amplifier coil with the variable coupling to the link and the twisted pair to the output terminals. Tubes and master oscillator frequency control box next. At the rear are the master oscillator tube and the FM reactance tube. The center socket is not used.

for VFO Operation on FM or AM



View showing completed VFO. Upper left is the output. Upper right is the volume control when used for FM operation. Center is the dial which controls the frequency

pair of beam tetrodes in the power amplifier stage (1625's or twelve volt 807's). The tubes in the amplifier are connected in parallel. The master oscillator and r-f power amplifier tuning capacitors are gauged, and an excellent worm drive, with plenty of reduction, is incorporated in the dial system. Included in each transmitter is a piezo-electric crystal and an electronic resonance indicator for calibration. This may be removed to make way for additional FM features, to be described later, or left as is if only AM VFO operation is contemplated. The power output may be varied from a few watts to approximately 55 watts according to the power supply on hand. Thus, one of these little jobs may be used as a fixed variable-frequency transmitter or as a driver for a higher-power amplifier.

The components are of exceptionally high quality and the assembly rigidly constructed. By using standard aircraft shock mountings (which are attached), the mechanical stability is excellent; and with a stabilized 200-volt supply to power the master oscillator, the drift is very small. This equipment was designed to hold the frequency quite constant in aircraft under vibration and extreme temperature changes; so it can be understood that the frequency variation will be practically nil with the set mounted on the operating table, subject to little vibration and relatively constant temperature.

Modifications for Amateur Use

At W5AJG, we were interested in a VFO unit to work directly into the crystal oscillator tube—in fact, to work in place of the crystal itself. Since all the crystal stages started with either 6 or 7-mc crystals (6 mc for the 144-148-mc band as well as the 50-54- mc band) it was decided to purchase the BC-458-A transmitter unit which covers 5.3 to 7.0 megacycles. Actually, this unit will reach to about 7.5 mc and will replace any 7-mc crystal.

It was decided to add a simple reactance tube modulator circuit and have the choice of either AM VFO or narrow-band FM transmissions. This was accomplished by a simple modification, and the unit works on either frequency or amplitude modulation. Should the crystal stage of the regular station transmitter start with a 3.5-mc crystal instead of a 6 or 7-mc crystal, the BC-696-A, with its range of 3 to 4-mc, should be selected.

The changes necessary to do the job are as follows. Reference is made to the *original* schematic, *Fig. 1*, and to the *modified* diagram *Fig. 2*. To begin with, the 24-volt former airplant battery supply is replaced with a 110 to 24-volt transformer for the heaters. These transformers are surplus stock in any mail-order catalog and sell for around $1.25. This is cheaper and easier than replacing the oscillator tube and the two tetrode finals with 6-volt versions, and obviates wiring changes in the heater circuits.

Next, the unwanted components are removed from the chassis—namely the variable antenna loading inductor *L*52 (this will serve admirably as an antenna tuning coil elsewhere around the station), as well as the antenna change-over relay *K*54. Relay *K*53 is either tied down in the energized position or removed and the wiring circuits closed. This relay switches plate voltage to the master oscillator and shorts out resistor *R*75 which was used for c.w. work. An extra feed-through insulator is employed to bring out the low-impedance line coupling the output transformer, *T*54, to the crystal oscillator stage of the transmitter it drives (*Fig. 3*).

For AM VFO operation, the above changes are all that are necessary. Of course a power supply, preferably a regulated 220-volt unit, is used to power the master oscillator—while anything from 200 to 550 volts, unregulated, is suitable for the amplifier, depending on the desired power output.

The dial is very closely calibrated and a 4,600-kc crystal resonator is used to check the calibration. This is very simply observed by tuning for maximum indication on the electronic eye tube and then noting if the dial reads exactly 4,600 kilocycles. The transmitter is then calibrated over the rest of the dial. This crystal does not stabilize the frequency in any way—it is merely a built-in standard to check the master oscillator dial setting. A crystal of another frequency could be substituted—for instance one spotting a particular pet or net op-

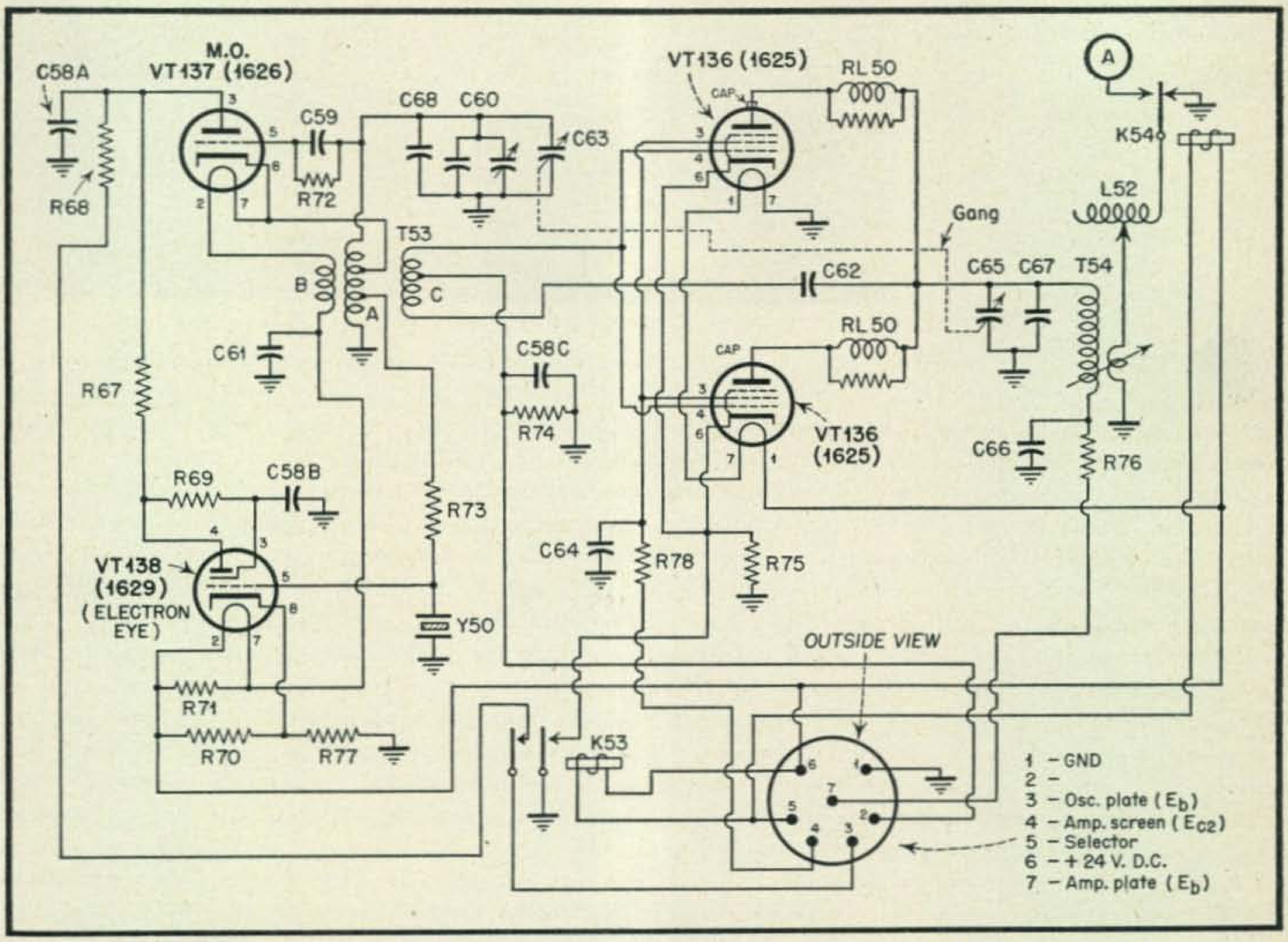


Fig. 1. Original schematic of the BC-458-A (5.3 to 7.0 megacycles with a bit of leeway). The following parts are identified:

C_{58}A, C_{58}B, C_{58}C—.05 μf
C_{59}—.00018 μf
C_{60}—master oscillator padding
C_{61}—.006 μf
C_{62}—fixed neutralizing
C_{63}—master oscillator tuning
C_{64}—.002 μf
C_{65}—power amplifier tuning
C_{66}—.01 μf
C_{67}—power amplifier padding
C_{68}—3.0 μμf
C_{69}—50 μμf
K_{53}—transmitter selector relay
K_{54}—transmitter output relay

L_{52}—antenna loading coil
R_{67}, R_{72}, R_{75}—51,000 ohms
R_{68}, R_{76}—20 ohms
R_{69}—1 megohm
R_{70}—1,000 ohms
R_{71}—126 ohms
R_{73}, R_{74}—15,000 ohms
R_{77}—390 ohms
R_{78}—51 ohms
RL_{50}—parasitic suppressors
T_{53}—oscillator coils
T_{54}—amplifier coils
Y_{50}—crystal unit
7-prong female plug, outside view

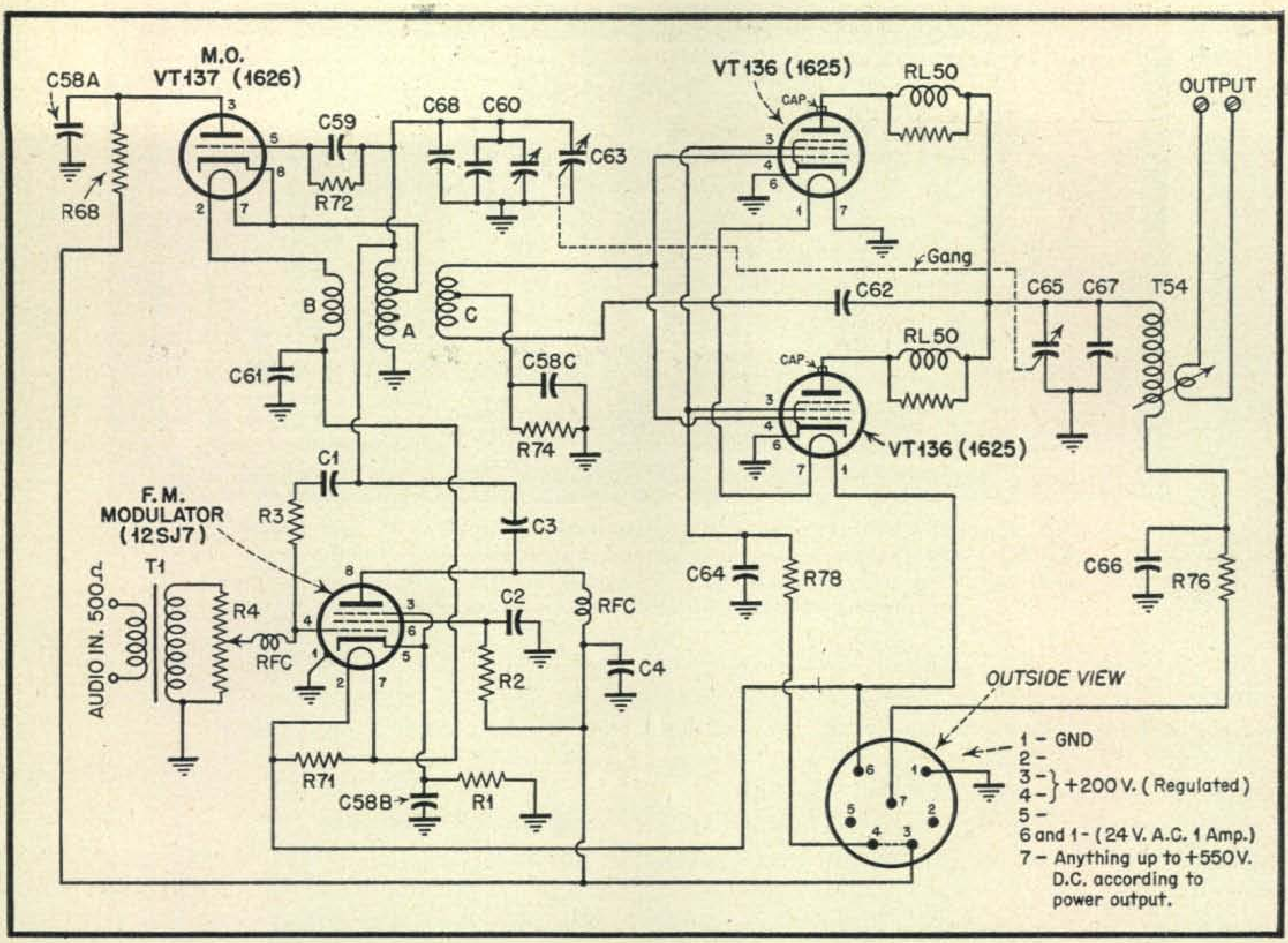


Fig. 2. Modified diagram of transmitter covering from 5.0 to 7.3 megacycles. Referring to Fig. 1., the following components were eliminated mainly from the electronic eye circuit: R_{67}, R_{69}, R_{70}, R_{73}, R_{77}, Y_{50}, K_{53}, K_{54} and L_{52}. Parts added for the FM reactance modulator comprise—

C_1—.00025 μf mica
C_2, C_4—.01 μf paper
C_3,—.0005 μf mica
R_1—1,000 ohms, ½, watt carbon
R_2, R_3—50,000 ohms, ½, watt carbon
R_4—500,000 ohms gain control
RFC—2.5 mh r-f chokes
T_1—line input audio transformer, 500 ohms to grid
12SJ7 metal or glass tube

eration frequency. This would enable the operator to place himself exactly on a particular frequency in the band.

Additional Modifications for FM

It is probable that the amateur will engage extensively in FM narrow-band operation in the near future as well as amplitude modulation. Advantages are claimed for FM in services closely paralleling amateur operation, such as mobile police and point-to-point communications. Not the least among these features is the very modest requirement in regard to modulating power. Also, existing superhets will do a good job of receiving FM transmissions. Later, of course, an FM channel will no doubt be standard equipment in all ham receivers.

By making a few more additional changes, the

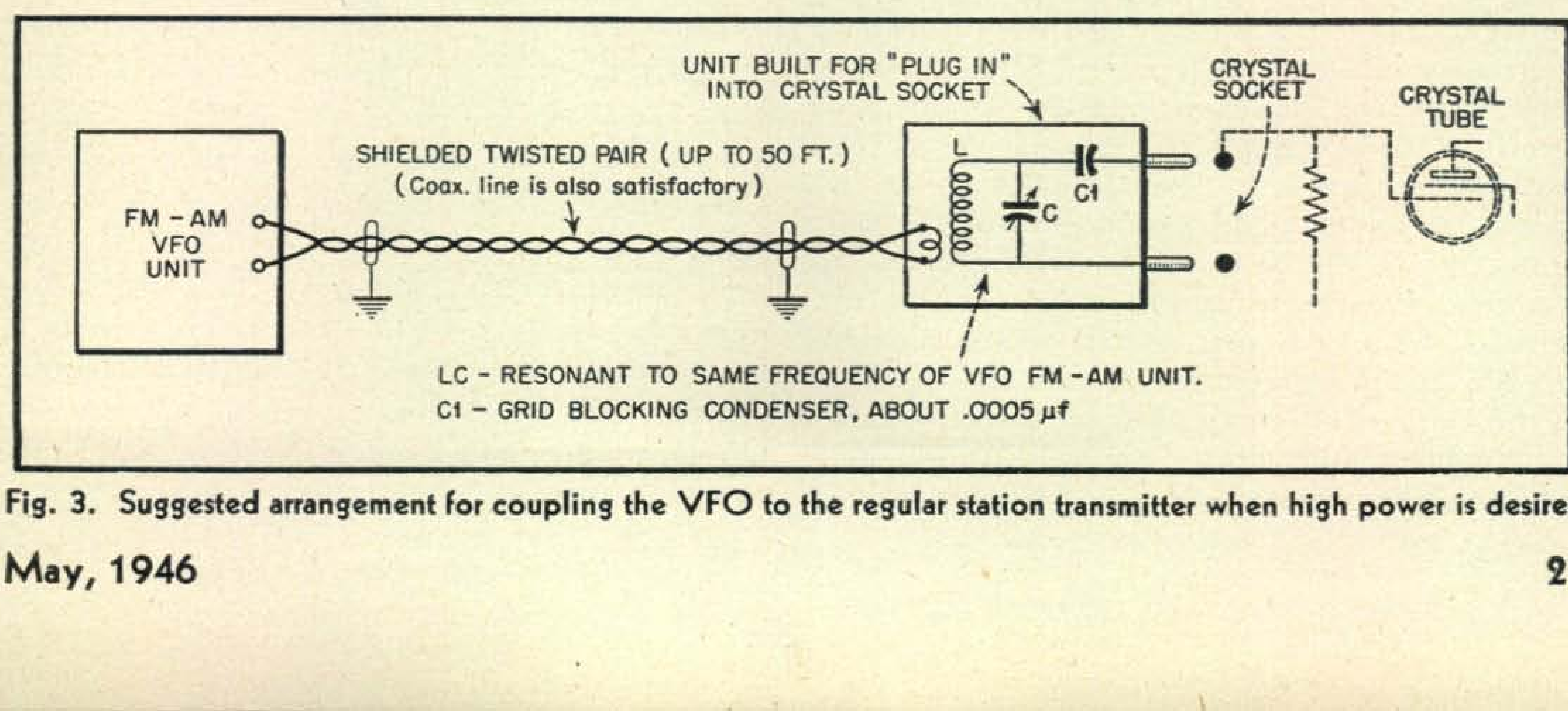
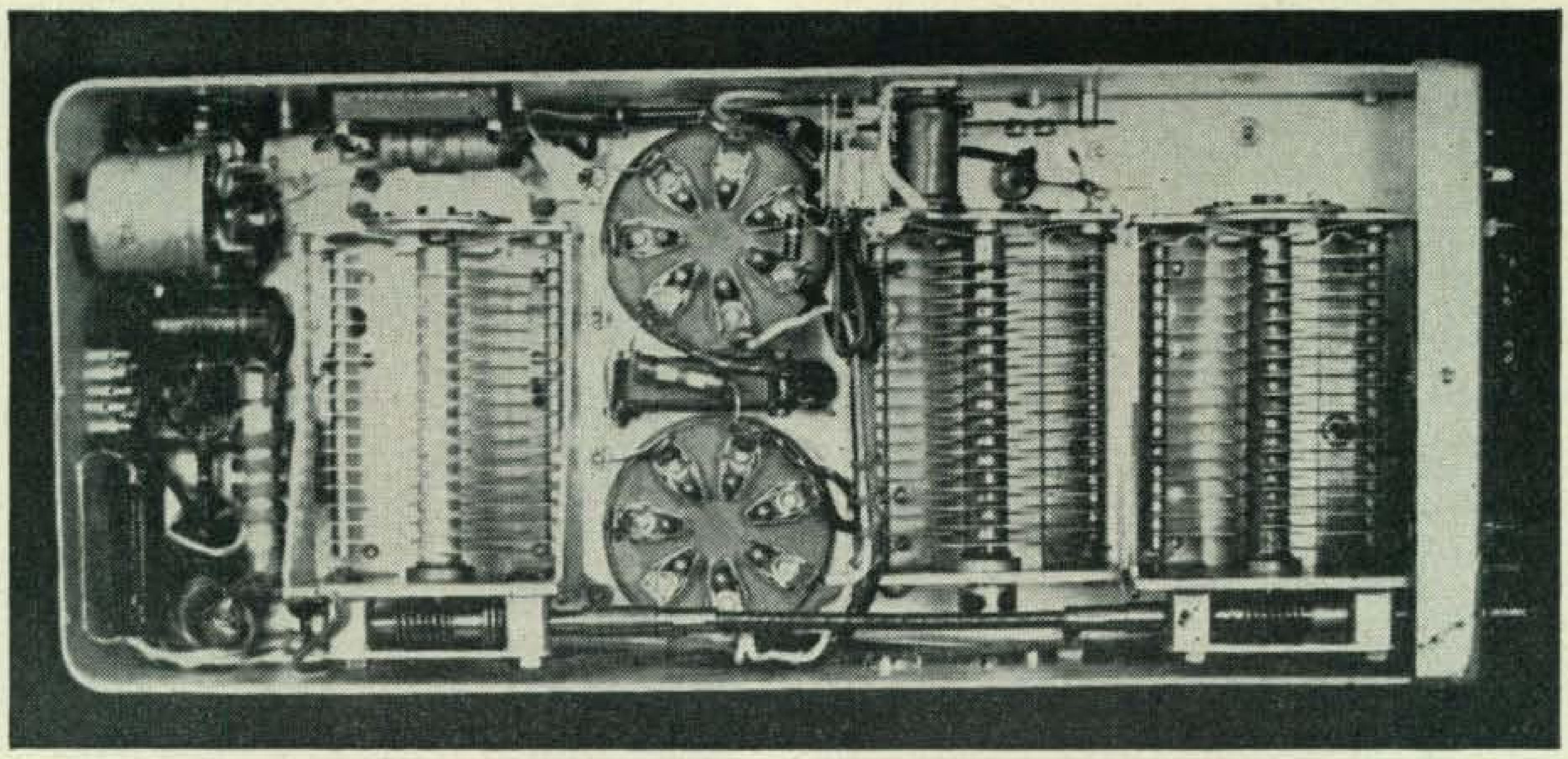


Fig. 3. Suggested arrangement for coupling the VFO to the regular station transmitter when high power is desired



This shows the bottom view and is practically as is when it comes from the ARMY. The reactance tube and components are mounted in the rear. The ganging of the Master oscillator and power amplifier condensers is clearly shown. Notice worm gears on the condensers.

already modified AM VFO can just as easily be converted to narrow-band FM operation. This is accomplished by adding a reactance modulator tube and shunting its output circuit directly across the master oscillator tube—thereby varying the frequency of the master oscillator in accordance with the audio applied to the reactance tube input circuit. Of course purely AM operation is still possible as above. The FM feature is additional.

Again referring to the original and modified schematics, the electronic eye (1629) is removed to make way for the substitute reactance modulator tube. This new addition will be a 12SJ7 type tube. Also the resonator crystal is dispensed with, and all wiring from these two sockets removed, with the exception of the heater leads to the 12SJ7 tube. Note that the original resistor *R*71 remains in the circuit across the heater terminals. The new wiring is simple and follows that in the modified schematic. A 500-ohm line to the grid transformer permits the output of the speech amplifier to modulate the reactance tube. Audio required is approximately zero db.

Should AM operation be desired, it is merely necessary to turn off the reactance tube gain control, *R*4, and plate modulate the station transmitter in the usual way. With FM operation, the zero db audio track is fed into the 500-ohm input circuit and the gain control turned up sufficiently to produce the required swing of the carrier. Of course the mean frequency may be spotted anywhere in the band by using the calibrated dial in the usual way. Needless to say, it is necessary, when using FM, to stay within the confines of the FM portion of the band. A swing of a few kilocycles on the fundamental frequency of the VFO will be multiplied by the same ratio of frequency multiplication in the transmitter. Thus, if FM operation in the 144-148-mc band is desired with a VFO frequency of 6 megacycles, a swing of 1 kc at this point will be multiplied by 24, which is more than ample for narrow-band amateur FM work.

Coupling to Main Rig

The output of the FM-AM VFO unit can be coupled to the crystal tube of the regular station transmitter in a number of ways. At W5AJG, a shielded twisted pair runs from the operating desk, upon which the VFO is mounted, to the crystal stage of the transmitter proper across the room (*Fig. 3*). The crystal is removed and a separate tuned tank circuit substituted by plugging into the crystal holder. Should the ex-crystal tube be a harmonic type, this tuned tank can be of the same frequency as the crystal. In tri-tet crystal oscillators, the cathode coil should be shortened. With pentode type oscillator tubes, it is usually possible to work straight through without self-oscillation. However, should 7-mc operation be primarily desired, it is advisable to choose a VFO unit operating on 3.5 megacycles so that the former crystal-controlled tube will operate as a doubler. In any event, care should be taken to avoid shorting the grid bias of the ex-crystal tube by connecting a blocking capacitor in series with the high side of the oscillator tube.

It will be found that the SCR-274-N makes a very nice VFO unit with AM or FM operation optional at a very low cost. It is suggested that those interested in obtaining equipment of this type, contact firms that rebuild and reconvert government aircraft apparatus to civilian requirements. As used in Army service there is usually about three times the amount of equipment needed for civilian purposes, and the surplus gear is generally available at a very moderate cost.

DX and Microvolts On the VHF

Simple charts assist in estimating distance and field intensities over quasi-optical ranges

ROBERT W. BICKMORE, W6QDV

WITH THE EXCEPTION of occasional freak transmissions, radio communication on the Very-High and Ultra-High Frequencies follows the "line-of-sight" path—that is, distances are limited to the unobstructed length of a slightly bent line between the transmitting and receiving stations. The curvature is caused largely by refraction, and the formula (which considers this refraction) for computing line-of-sight distances is—

$$D = 4130\ (\sqrt{H_t} + \sqrt{H_r})$$

—where D is the theoretical maximum range or distance, and H_t and H_r are respectively the heights of the transmitting and receiving antennas. All measurements, here, are in meters, and heights are relative to a fairly level terrain. For instance, at sea-level, the height of a radiator mounted on a 100-foot tower would be 100 feet. However if the antenna support were erected on a 500-foot elevation of the Cliffs of Dover, the height would be considered 600 feet. On the other hand, if both transmitting and receiving aerials were constructed on a common plateau, 5,000 feet above sea-level, the height, for calculation, would only be 100 feet.

The determination of transmitting range is considerably simplified in the chart of *Fig. 1*. It is only necessary to cross a rule or straight-edge from the height of the transmitting antenna to the height of the receiving aerial to read the distance on the center column. Conversely, by pivoting the straight-edge on the center or range column, a combination of various

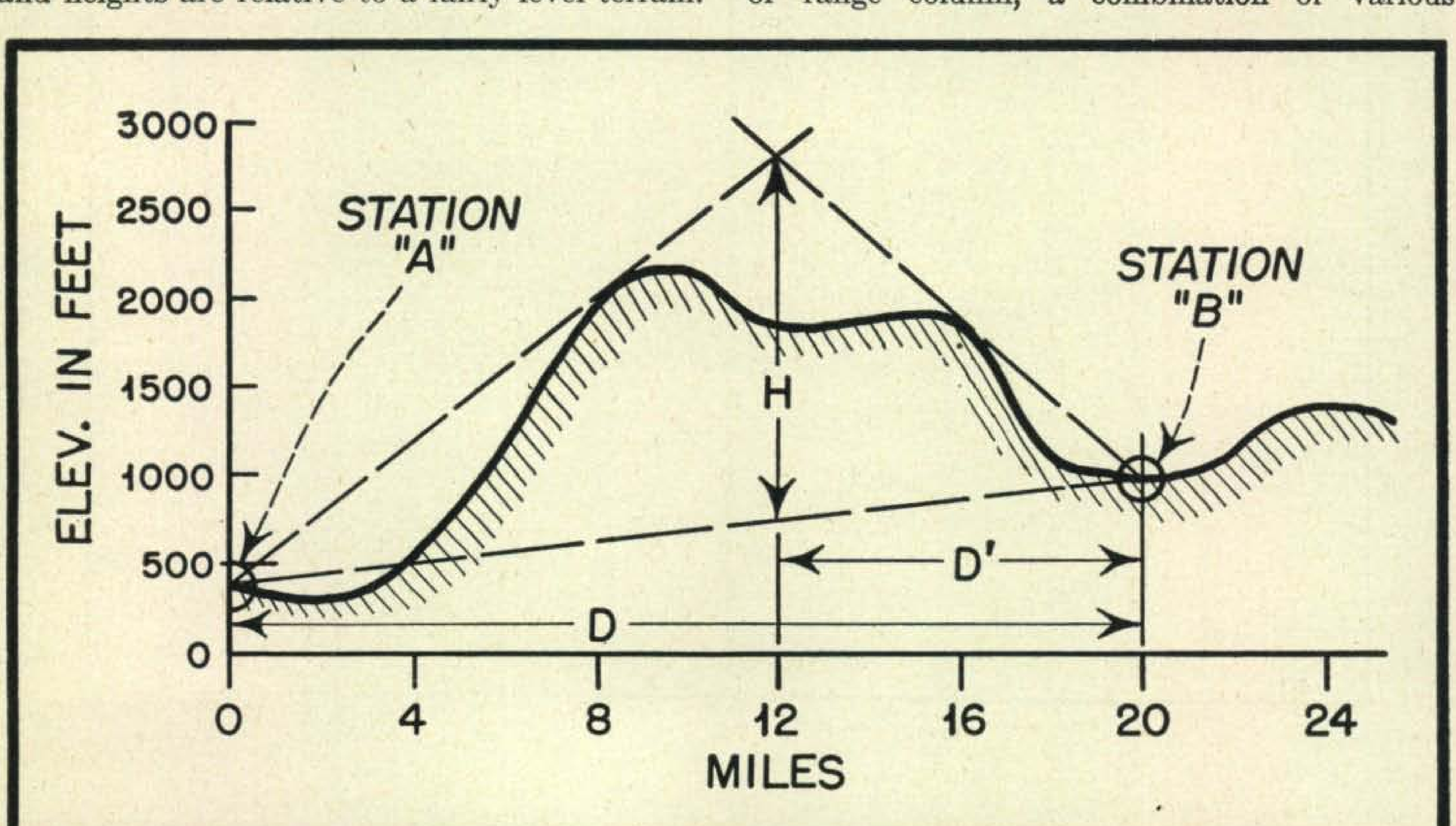


Fig. 2. A profile map, with elevation scale enlarged 20 times. The triangular distances are used to estimate field strength in Fig. 3. Measurements in feet and miles

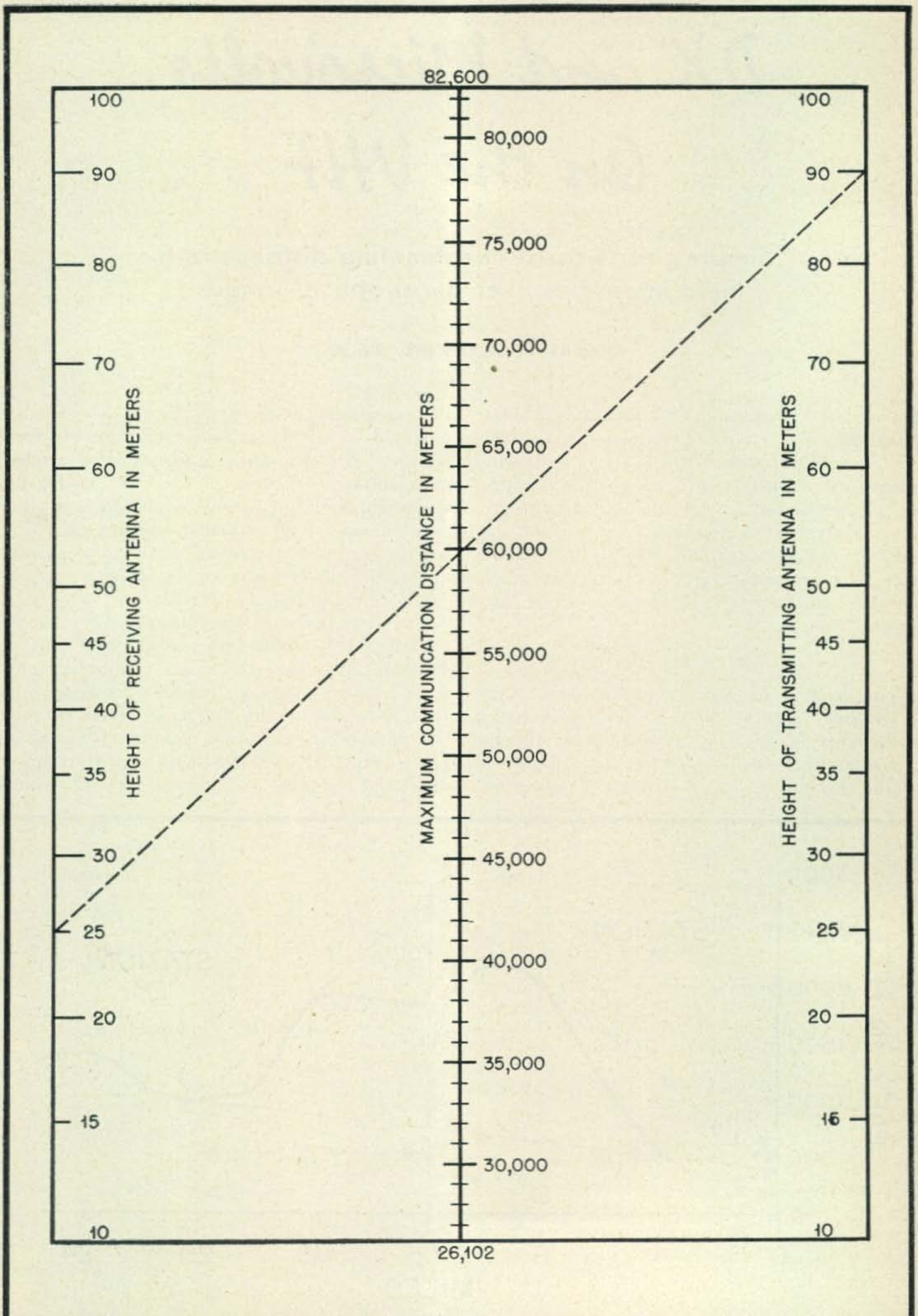


Fig. 1. A line drawn across this chart shows the correlation between antenna elevations—transmitting and receiving —and line-of-sight distance. Elevations and distance are in meters

heights for the circuit terminals, as best adapted to local facilities, can be immediately determined. For example, the maximum range of a VHF system having antenna elevations of 25 and 90 meters would be 60,000 meters.

Antenna Heights

The effective height of an antenna located on level ground (for the first half mile or so in the direction of the other station), is the height of the center of the radiator above ground level at the base. As previously indicated, the effective height of an aerial erected on the edge of a precipice falling off in the direction of the complementary station is usually assumed as the difference in elevation between the center of the radiator and the base of the precipice—i.e., the mast height plus the elevation of the cliff. In the intermediate case, where the antenna is erected on a hill sloping downward toward the other station, the effective height depends on the steepness and uniformity of the slopes. An empirical rule, that checks reasonably well with experimental data involving more-or-less uniform slopes, calculates the effective antenna height as equal to the height of the center of the radiator above ground plus one-half the difference in elevation between the ground level at the antenna tower base and the ground level one-half mile distant in the direction of the complementary station.

Field Intensity

The charts of *Figs. 2* and *3* endeavor to correlate line-of-sight distances, obstructive influences and field intensitities. Correction tables extend the utility of the charts to different powers and types of antennas. These charts are based on the theory of radio propagation over a smooth, spherical earth, and consider shadow losses as derived from optical diffraction. Refraction under average conditions is accounted for by assuming the effective radius of the earth as one-third larger than the true radius. It should be remembered, however, that results obtained from these charts, at best, can only be approximate.

Instructions

Referring to *Fig. 2*, trace an approximate profile of the straightline path between the two stations, using elevations obtained from a contour map. Draw a triangle on the profile, formed by a line joining the base of the transmitting antenna with the base of the receiving aerial, and lines from each antenna base tangent to the hill blocking the line of sight. It should be noted, in *Fig. 2*, that the elevation scale has been enlarged twenty times to provide a workable triangle.

From the triangle, observe three quantities: The distance D' from the perpendicular of the triangle apex to the nearer station, the projected distance D between the two stations, and the height H from the base-line to the apex.

Working now on chart *Fig. 3*, draw a straight line through the point representing D' (from *Fig. 2*) on *Scale 1* and the point representing height H on *Scale 2*, extending this line to cross *Scale 3*. Draw a second line from the intersection of the first line with *Scale 3* to the point of *Scale 4* representing the distance D (in *Fig. 2*). This line is extended to intersect *Scale 5*, which indicates the estimated field strength in db above and below one microvolt-per-meter.

Corrections

This estimate applies to a radiated power of 50 watts from a half-wave dipole fifty feet high. Correction must be made to the field-intensity value, found in *Fig. 3*, for other than approximately identical conditions. A coaxial antenna is here equivalent to a half-wave dipole. The value from the chart is added algebraically to the following corrections to obtain the final field intensity.

Correction Tables

Effective Antenna Height in Feet	*Correction In db*
25	–6
50 (reference)	0
100	+6
200	+12
500	+20

Radiated Power In Watts	*Correction In db*
0.5	–20
1.0	–17
2.0	–14
5.0	–10
10	–7
20	–4
50 (reference)	0
100	+3
50 (reference)	0
100	+3
200	+6
500	+10
1,000	+13

For instance, in reference to *Fig. 3*, if we substitute an antenna height of 25 feet (–5 db) and increase power output to 500 watts (+10 db), the field intensity will be + 5 db.

No table is provided for various types of antennas, since their gains are usually expressed in

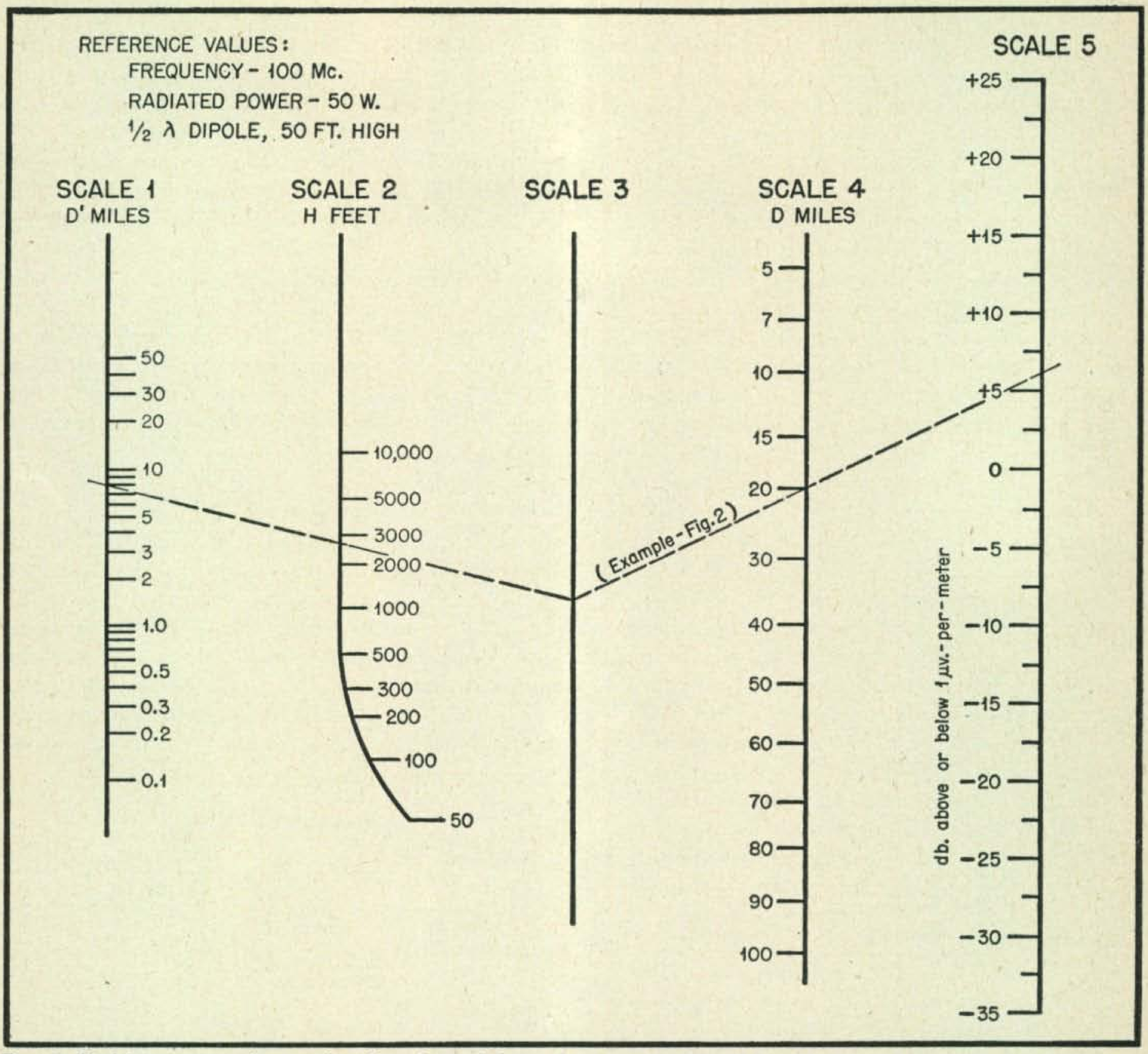


Fig. 3. Field intensity chart with value derived from the triangle (Fig. 2.). Horizontal or vertical polarization. Scaled in feet and miles

decibels above a half-wave dipole. It should be remembered that gain at both ends of the radio link—transmitting and receiving antennas—must be considered in making these predictions.

In general, the following estimates of performance have been found quite reliable—though it is, of course, impossible to take into account all variable factors. (For this reason, "unsatisfactory" circuits occasionally work out fairly well, and vice versa.)

Field Intensity	*Performance*
Less than + 5 db	Unsatisfactory
+5 to +15 db	Questionable
More than +15 db	Satisfactory

FILAMENT TRANSFORMERS

Filament and power transformers are still on the list of very scarce items; the following stunt once saved the day at W2ESO/W2OLB when we ran out of 6.3 volt windings, and was recalled recently to turn the trick for our friend W1DTG, who put in a pair of 807's on ten, but was unable to get a power transformer with other than 7.5 volt and 2.5 volt filament windings.

Here's the life-saver as shown in Fig. 1: One half of the 2.5 volt windings (1.25 volts) is used to buck the 7.5 volt secondary, thus delivering very close to the required 6.3 volts. Proper phasing must be determined experimentally, and if an AC voltmeter is not available, an auto or pilot lamp should be tried between the free 7.5 volt lead and, alternately, the ends of the 2.5 volt winding. The correct pair will be obvious, as the other possibility

[*Continued on page 55*]

A Two-Band Antenna
WITH LOW-IMPEDANCE FEED

EUGENE BLACK, JR., W2ESO/W1NVO

Antenna space for 80 and 40 is a problem for most amateurs. One antenna that will work efficiently without tuning on both these bands is W2ESO's solution

AT 14 MC and above, compact beams giving worthwhile power gains are so easy to construct that there is little justification in considering a non-directional antenna for a permanent installation.

The picture is completely different on the 3.5 mc and 7-mc bands, however; not only are even the simplest beams out of the question for most of us, but the type of operation on these bands usually requires general coverage. To retain elbow-room for higher frequency directional antennas, (and also to keep the neighborhood from looking too much like the top of a 50-family New York apartment house) it is desirable to have one antenna serve for the two lower frequency bands. This can be accomplished in a number of ways, as reviewed below, but there is one solution which eliminates drawbacks inherent in the more conventional systems.

The End-fed Hertz

The end-fed Hertz has the advantages of simplicity and ease of adjustment, so far as the radiator itself is concerned. Disadvantages are unfortunately also numerous: With any appreciable transmitter power, r.f. appears in unexpected places, such as neighbors' radios, lighting circuits, key and microphone leads, and anything else around the shack, including your pet VFO and speech amplifier. In addition, a separate antenna tank is necessary to protect against radiating harmonics, bringing in one more control to complicate QSY, and one more coil to complicate band-changing.

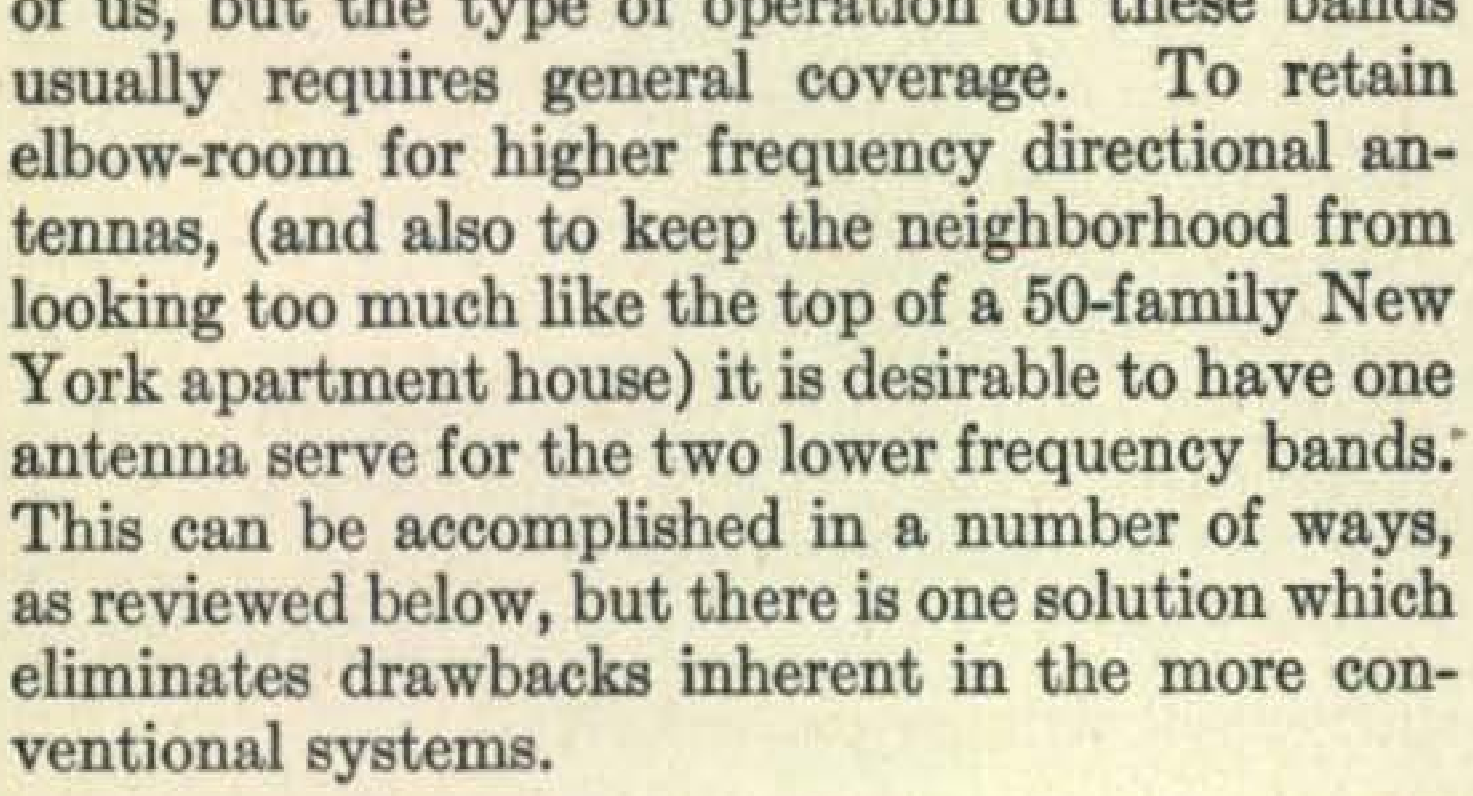


Fig. 1. The solution to the antenna problem for 7 mc—general coverage and no tuner required

In addition, such a radiator, close to earth and other objects, is bound to have an abnormally high end impedance (especially on 3.5 mc) and therefore loads the antenna tank poorly and requires unusually high voltage insulation and a high voltage antenna tank condenser.

Single Wire Feed Matched Impedance Antenna

In theory, at least for one band work, the single wire feed matched impedance antenna is fine. The feeder, being tapped on the antenna at a point such that it sees its own impedance, carries only moderate current and should radiate little energy.

In practice, all the disadvantages of the end-fed antenna apply here, with the possible exception of loading difficulties. The trouble is that the single wire feed antenna is a tricky system to adjust, and most amateurs just don't have the time and equipment to do the job right. When there is an impedance mismatch between the feeder and the point of connection to the radiator, a standing wave appears on the feeder, and feeder radiation goes up rapidly, since we have no counterbalancing feeder as with an open-wire or twisted-pair line. All of the Hertz troubles may appear, depending on the magnitude of the standing wave and the impedance at the sending end of the feeder.

When two-band operation is attempted, we are no longer backed up by theory. The things become a compromise, and a barrel full of trouble can be avoided only by juggling antenna length, feeder length, and tap point—simultaneously. Wonderful how simple these things can be—or is it?

The Center-fed Doublet and the Zepp

The Zepp, which is end-fed with open-wire line, and the center-fed doublet with a similar open-wire-feeder may be discussed together.

The chief objection to both these systems is that an antenna tuning system is required. A further annoyance is the fact that some feeder lengths result in an installation that is hard to feed, and it is sometimes difficult to find a suitable feeder length for easy tuning on two adjacent bands.[1] A minor nuisance is the occasional need for switching from series to parallel tuning or vice versa when changing bands—usually necessary when using center-feed.

Center-feed results, of course, in an elementary directional array when second harmonic operation is employed. The theoretical gain in the favored directions is so small that it would seem that the loss off the ends would be negligible. That's what we thought, too, and our enlightenment led to the development of a multiband job with none of the foregoing headaches.

A Multiband System

In our last location before Pearl Harbor, there was a dearth of trees, and only one possible place for an antenna in the clear—a 150′ span, on a line East and West, with the house in the middle. Up went a center-fed doublet for 80, 134′ flat-top, center-fed with 4″ spaced feeders, and on 40 we proceeded to get nice reports from W4 and K4—very nice, in fact, but when the skip lengthened in the evening, and there was nothing legal for us to QSO to the South, and, of course, nothing at all North, it didn't take long to find out that said antenna might as well have been buried in the basement as far as W5, W6, and W9 were concerned. The receiving antenna, a simple 66′ doublet running North and South and only 15′ above the ground, fed with very light twisted pair, was at least two or three "S" points better to the West when hung on the rig.

A little bit of head-scratching was in order here. We had no room for separate antennas, we disliked the necessity for the additional antenna tuner, and conceded that it would be necessary to continue feeding one antenna at the center. It was also obvious that on 7 megacycles, the two half-waves in the flat-top would have to be fed out of phase to get the usual four-lobe pattern, which past experience had shown to be good enough for general coverage.

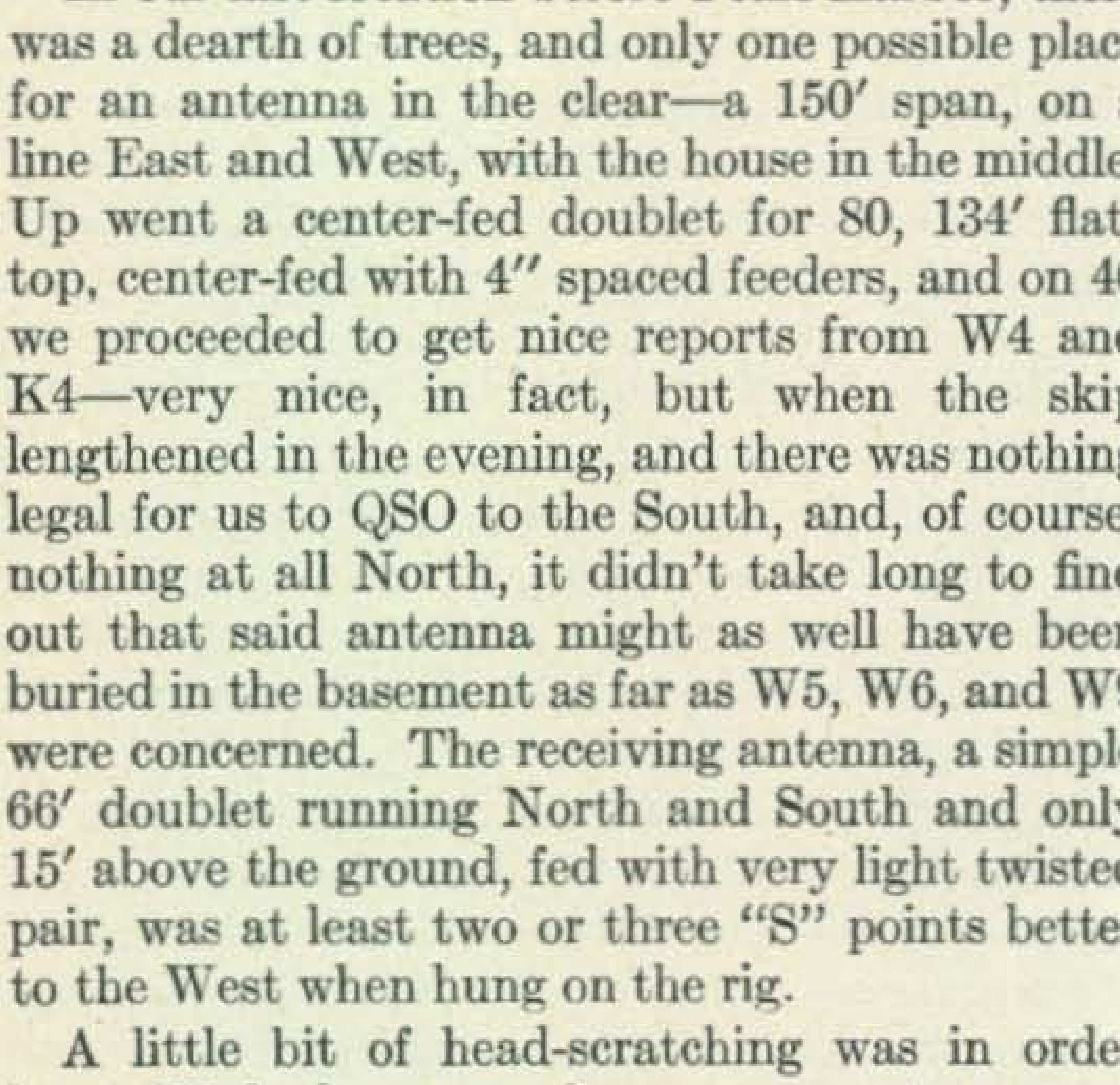


Fig. 2. The complete two band antenna uses low impedance feed on both 3.5 and 7-mc bands

With pencil and paper we first tackled the problem of 7-megacycle operation, and came up with one possible answer illustrated in *Fig. 1*. The high impedance at the center of the antenna could be transformed into a low (resistive) impedance at the transmitter by means of a quarter-wave open wire feedline. Quarter-wave length (approx. 33½′ on 7 mc) would be all right in this case, since the rig was in the upper part of the house. Phasing of the two half-waves in the antenna would be as desired, since they would be fed in parallel from the same point. Our handbook quoted 3000 ohms as an average value of impedance at the end of a half-wave radiator, so we assumed a value of 1500 ohms as the parallel impedance of the two half-waves at the center of the antenna. The characteristic impedance of our quarter-wave transformer would be around 400 ohms, and as this would be the geometric mean between our 1500 ohm load and the sending end impedance, we were able to predict that the sending end impedance would run around 100 ohms. It seemed likely that a small coupling coil would be sufficient, with no additional tuning needed.

Three and five-tenths mc operation would be most easily achieved by breaking the radiator at the center and using a twisted pair line. While we were pondering the advisability of a switch across the center insulator, suspended in mid-air and operated by mental telepathy when changing bands, it occurred to us that it might be possible to achieve the same effect, electrically, by merely shorting the twisted pair at the transmitter. It looked worth a try, so the next week-end we tossed together the combination diagrammed in *Fig. 2*.

Feeder length was purposely made somewhat greater than the calculated quarter-wave value, figuring that if necessary we could shorten the section by adding another insulator in series with the one suspending the dead feeder.

However, the length of this section was found to be non-critical; our initial set-up permitted us to load the final properly on 7 mc with the same fixed link that had been used to feed this 66′ doublet, and plate current under load decreased only about 10 percent in going from 7000 kc to 7300 kc. Some of this was, of course, attributable to normal variation in impedance of the radiator itself. We had hoped to investigate

[Continued on page 57]

A selsyn generator and motor, size 5, made by two different manufacturers and used in W1KVV's indicating system

Putting the Selsyn to Work

MERLE C. WORSTER, W1KVV

Rotary beam indicators have always been a problem in the average ham shack. Selsyns provide a straight-forward solution that is simple and reliable

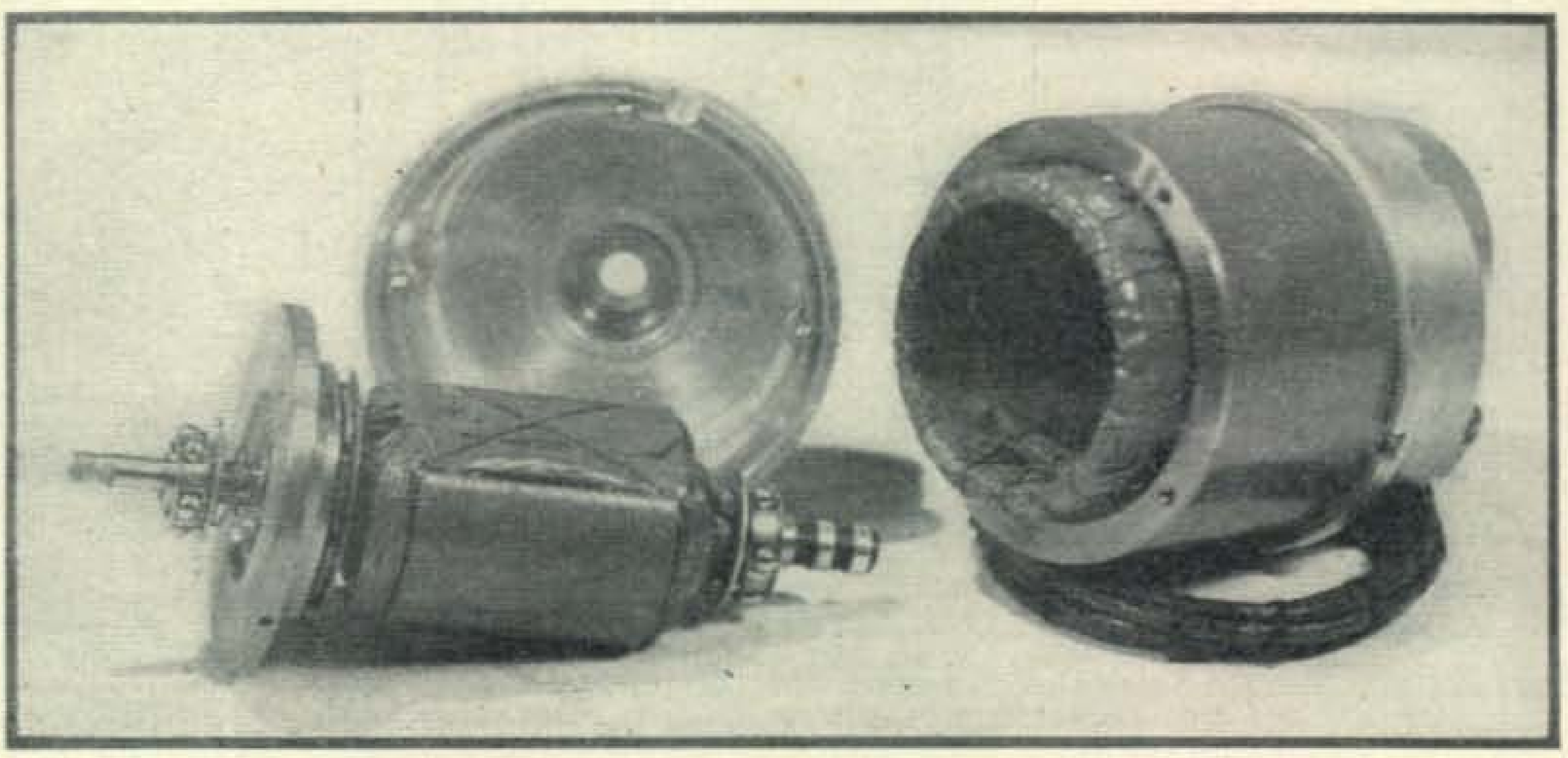
THE PROBLEM of an inexpensive, simple and accurate means of indicating the direction of a rotary array has been solved for the amateur by the release of war surplus selsyns. These units are ideal as rotary indicators and have been reasonably priced on the market from about five to twenty dollars a pair.

The word "Selsyn" is a trade name and belongs to the General Electric Company. However like "Jello" and other popular trade names it has become the accepted name to use. Selsyn is an abbreviation of the words "self-synchronous." There are several different makes on the market but they differ only in mechanical construction; electrically they all operate in the same manner.

Selsyn Types

There are several different types of selsyns available, six to be exact. They are: generators, motors, differential generators, differential motors, control transformers and exciters. As the first two are the types that comprise a simple selsyn circuit, this discussion will be confined to them. The size of the selsyn is governed by the torque produced and in turn by the physical limitations imposed to manufacture a unit to produce the required torque. At the close of the war there were ten different sizes available. Number one size produces the smallest amount of torque, also being the smallest in physical size, and number ten produces the largest amount of torque, being the largest in physical size.

Exploded view of 5F Selsyn motor showing damping ring on rotor shaft. In the background is the bell end-over



For amateur purposes, where all that will usually be rotated is a pointer or some simple method of indicating direction, any size selsyn will do the trick very nicely.

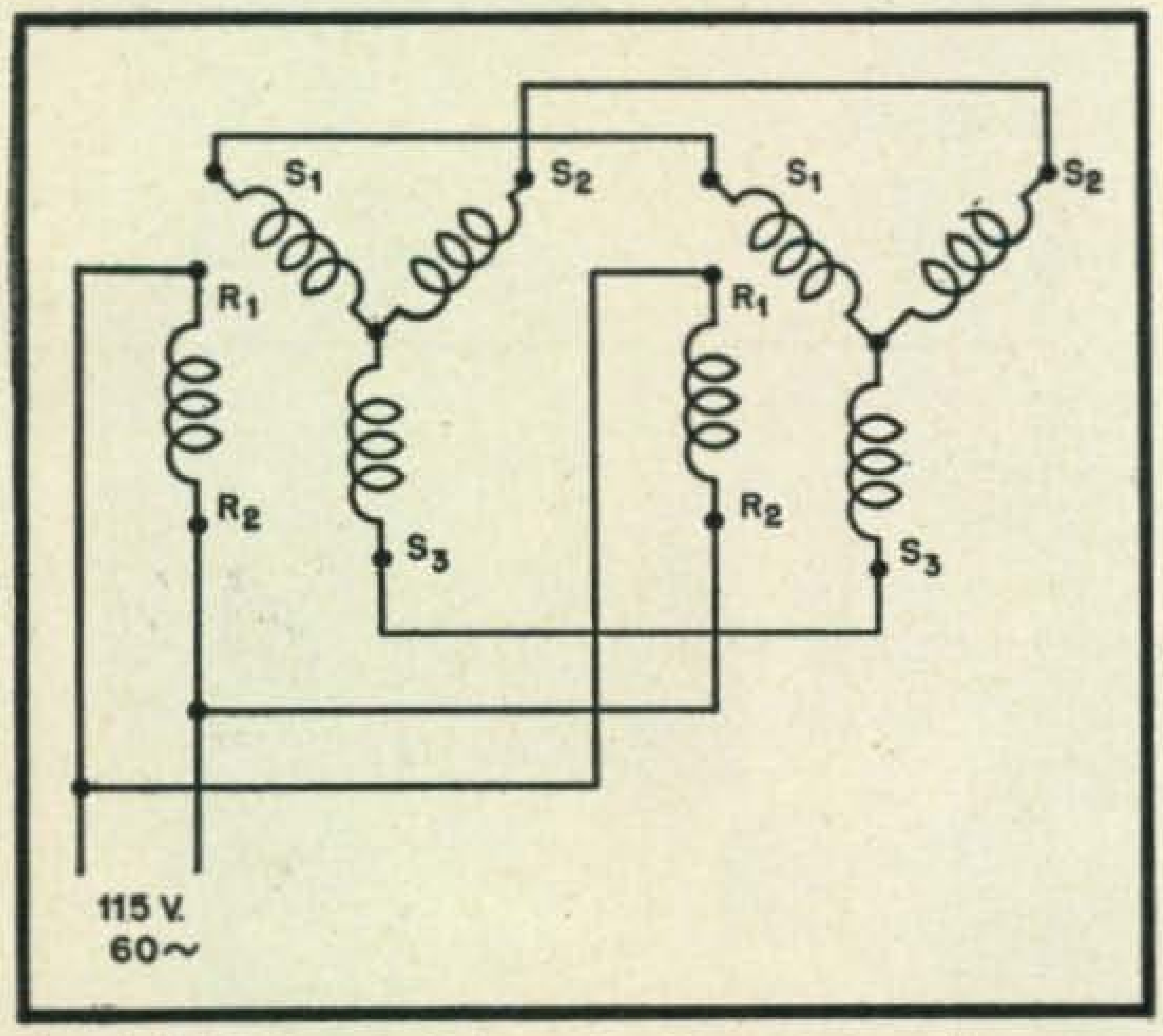
The photos show different selsyns purchased by the author. The selsyn on page 30 in the fancy case is a small 1F selsyn. The case it is mounted in is an old aviation course indicator. The innards were taken out, the case chucked in a lathe and bored out to take a selsyn and the shaft of the selsyn cut to the proper length, drilled and tapped. The unit was reassembled, the pointer fastened to the shaft with a small machine screw and the result – the nicest direction indicator anyone could wish for. The other two selsyns (top of page 29) are size five and were made by two different manufacturers.

Direction indicator at W1KVV consists of a 1F selsyn motor mounted in a aviation course indicator case

The Selsyn Circuit

Mechanically, the selsyn resembles a small motor. Electrically, it consists of a single concentrated winding on the rotor. The connections to this winding are brought out externally through slip rings and are designated R1 and R2. In some types they may be designated X and Y. The stator consists of three windings, spaced 120 degrees apart and Y connected. These windings are marked S1, S2 and S3. In selsyns made by some other manufacturers the reverse may be true, that is, the single winding will be the stator and the three windings the rotor. In either case the operation is the same.

A simple selsyn circuit is shown in *Fig. 1*. It consists of two selsyns, one a generator which is the source of the reference voltage and the other a motor which is the receiving unit. In the case of a rotary array where the indicating unit will be free to turn with very little friction involved, a pair of generators or motors will work very well. The two rotors are connected together and are fed from a common source. The stators are connected together, S1 to S1, S2 to S2 and S3 to S3. With voltage applied, an exciting field will be set up around the rotors which will in turn set up voltage in the stator coils. Assuming the rotors are free to turn, the same voltage, and consequently the same fields will exist in both stators. If one rotor is held and the other displaced a few degrees from the position of the rotor being held, the voltages in the stator fields will become unbalanced. The circulating current caused by the unbalance of the voltage will react upon the exciting flux produced by the rotor and will produce torque which will tend to turn the rotor to a position where the voltages are again balance and opposite. In this manner one selsyn will follow any mechanical motion of the other. All that is necessary is to couple one selsyn to the shaft that rotates the beam, connect the other to a pointer of some type in the shack and away we go. The beam rotates and in turn the selsyn connected to it turns. The selsyn in the



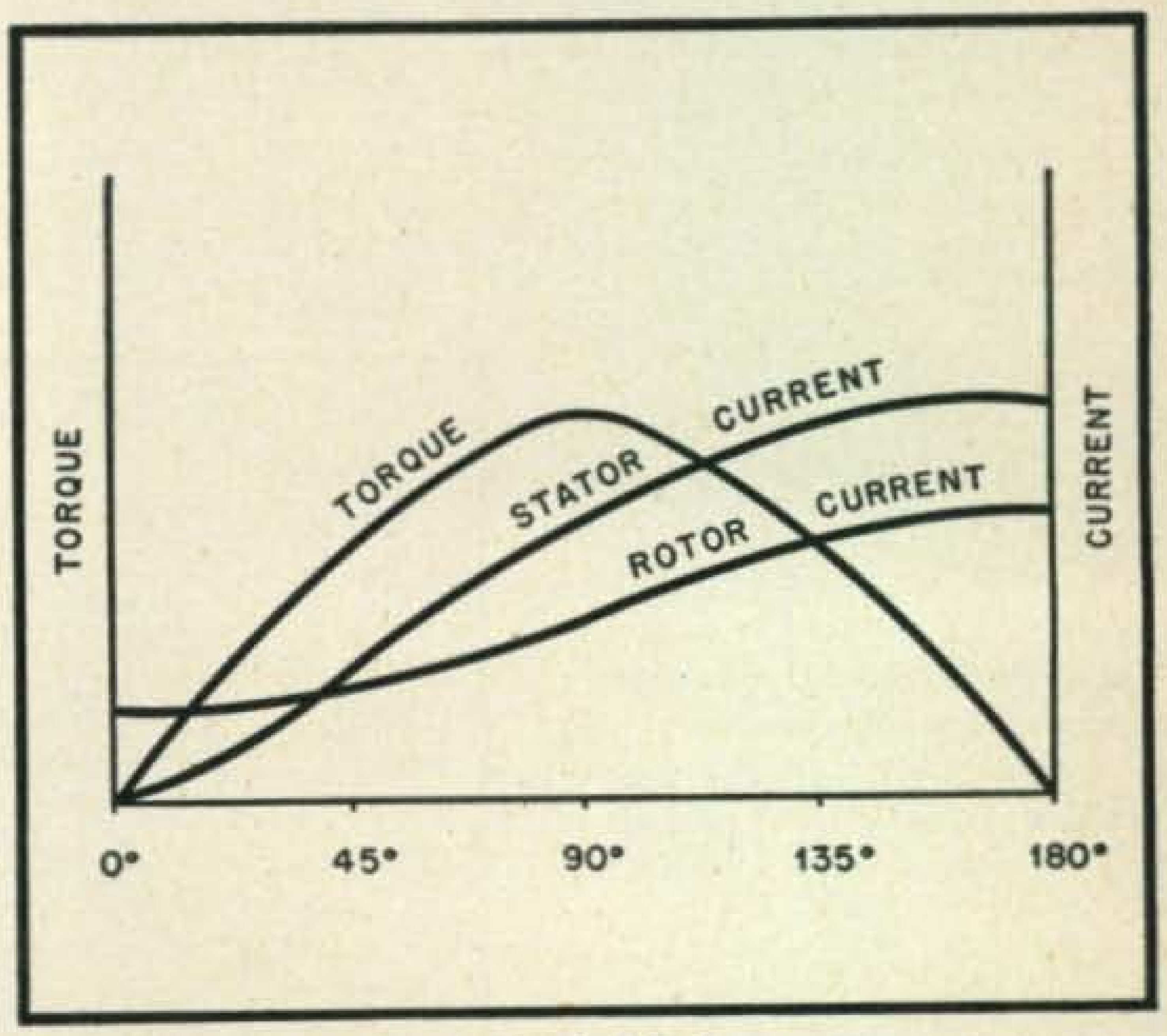


Fig. 1. (left) Simple Selsyn circuit consisting of generator and receiving unit. Fig. 2. (right) Selsyn torque, excitation and stator current for different angles of displacement

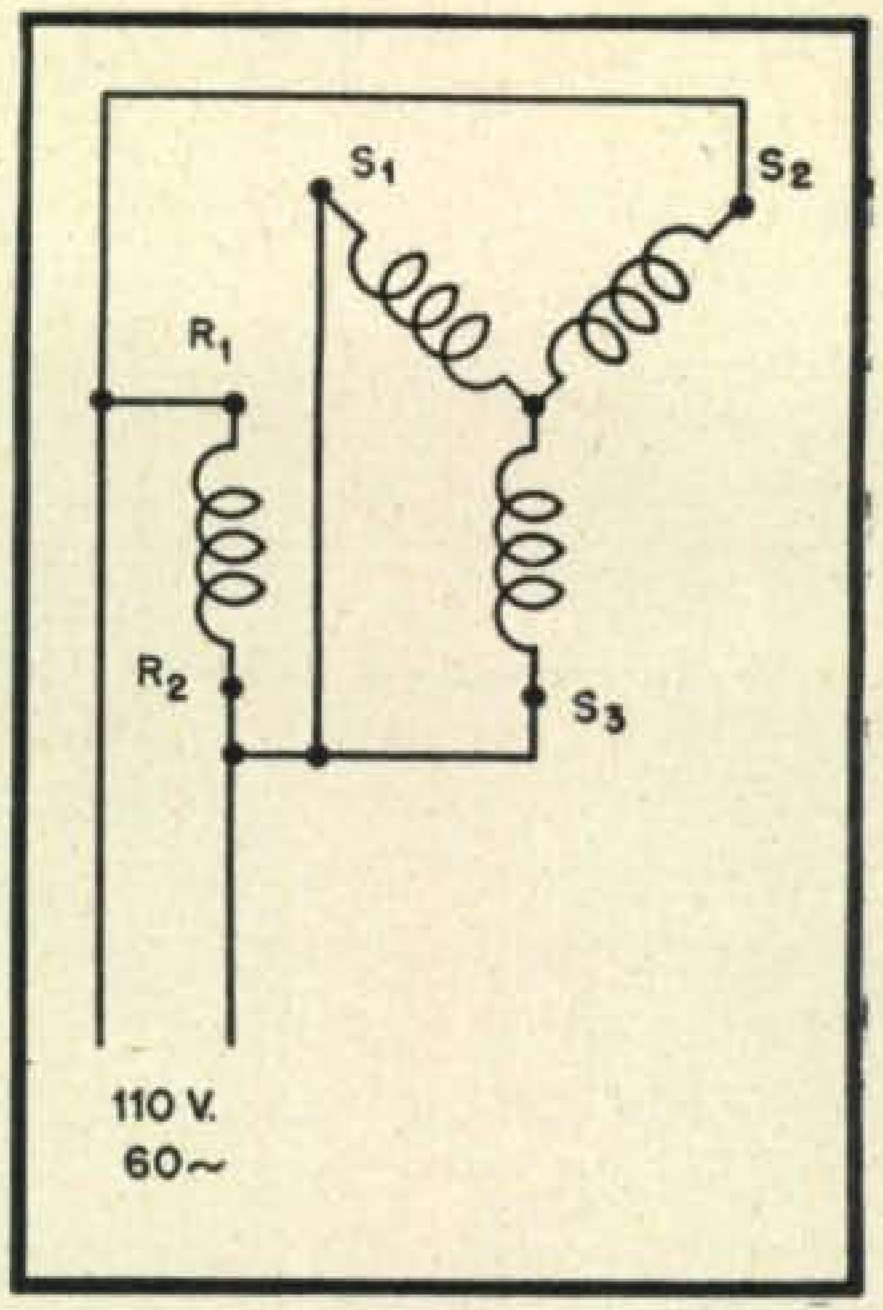
shack follows every movement of the sending selsyn. A perfect indicating system, it is the most accurate means of electrical indication of mechanical motion.

Fig. 2 shows the torque, excitation and induced stator current for different angles of displacement. Note that in a position of 180 degrees the torque has dropped to zero. At this point the selsyn is rather unstable and will never operate properly of its own accord. Also note that the current rises as the angle of displacement increases. The selsyn should never be held at a fixed angle of displacement of more than 20 degrees for any period of time for the circulation current will rise to a point that will burn out the windings. In its synchronous state, the selsyn consumes very little power.

The difference between the generator and the motor is purely mechanical. The motor contains a damping disk usually made of brass or lead to prevent hunting or oscillation. It is coupled to the shaft through a friction clutch arrangement. Any sudden changes of direction, first have to overcome the inertia of the damping disk. As the selsyn approaches the point of synchronization its torque drops to zero. As it passes this point, due to its own inertia, it encounters a reversed field. Due to this reversed field, the rotor quickly reverses its direction of travel and starts backwards. This would keep up as the selsyn "hunted" about its point of synchronization if no method of damping out these oscillations were provided. The damping disk, through the inertia it provides, overcomes this trouble.

As previously pointed out, where the speed of rotation is very slow, as in the case of an amateur rotary beam, a motor will not be necessary. A generator may be used with no trouble.

Fig. 3. Connections to determine electrical zero which is neutral position before placing selsyn into operation. This could be True North or any other reference point desired



Operating the Selsyn

The selsyn should be set on its position of electrical zero or its neutral position before placing into operation. The beam could be pointed North and that point called zero for the beam. To set a selsyn on electrical zero there is a choice of two methods. In both cases it is assumed that the selsyn is uncoupled from its driving source. The telephone method requires a pair of high impedance phones. The phones are connected to S1 and S2 and 115 volts a.c. is connected to R1 and R2. The selsyn is then rotated to locate the point of minimum hum. This is the electrical zero point. For the second method, connect the selsyn as shown in *Fig. 3*. Hold the shaft lightly between your fingers to prevent its spinning and apply the voltage. The selsyn rotor

[*Continued on page 53*]

Trouble	Cause
1. Indicator is displaced 180 degrees from the generators' zero position.	R1 and R2 are interchanged.
2. Indicator is correct at two points, zero and 180 degrees, torque is low.	Rotor lead is open.
3. Indicator only operates properly at two points 180 degrees apart. Torque is low and indicator comes to rest varying positions.	Stator lead is open.
4. Direction of rotation is reversed.	S1 and S3 are interchanged.
5. Direction of rotation is reversed and the indicating selsyn is off 240 degrees from the zero position of the transmitting selsyn.	S1 and S2 are interchanged.
6. As above, but error is 120 degrees.	S2 and S3 are interchanged.
7. Indication is erratic and indicator shaft moves in erratically.	Bad bearings, sticky shaft, too much friction in the system.

Calls Heard

Send all contributions to Calls Heard Editor, CQ

W. B. Martin, W3QV/XU1YV, Tangku, China
February 6 to March 6, 1946
(28 mc)

W1NSS/K6; 1NSW/J; 1LWO/?; 1KDL/J; 1LSV/?; 1WV/6; 1HCH/K6; 2LNL/KA; 2KQT/-KB6; 2JE/J5; 2NKO/J; 2JUA/?; A2VO/K6; 2GPS/J; 3ILD/KA; 3JLW/K6; 3ART/XU; 3DGM; 3FQP; 4YA/XZ; 4EPT/K6; 4FXC/?; 4ESR/J; 4JRF/?; 4GJA/KB6; 4FIJ; KB4BX; K4ETT; 5DBT/J; 5KDA/J; 5KIO/J; 5BYZ/KA; 5JZQ/?; 5IZC/?; 5MPC/KA; 5DBA/?; 5HHO/J; 5HPC; 5KFE/KB6; 5ADZ; 6EHW/K7; 6OZB/J; 6PKP/?; 6ENV; 6LEE; 6IDY; 6ITM; 6HBD; 6KIG; 6ANN; 6AM; 6NDW/KA; 6MVL/J; 6BZF/?; 6NFH/K6; 6KHV/?; 6MBA/J; 6UKW/?; 6QBK/?; 6NEW/KA; 6KFY/?; 6QUD; 6RBQ; 6NHS/K6; 6IAA; 6PVE/J; 6ENI; 6PNO; 6DZT; 6SGQ; 6ITA; 6TKX; 6KNH; 6OSH; 6WB; 6KEV; 6CHE; 6EXQ; 6PYG; 6LV; 6LXQ; 6DTN; 6SA; 6WN; 6MJG; 6GRR; 6POZ; 6MHB; 6SHW; 6GZA; 6AK; 6OLL; 6TDE; 7PEF/?; 7HCQ/KB6; 7DMN; 7VY; 7HKU/?; 7BAC/?; 7BQX; 7CGL; 7GDU; 7DW/6; 7HZE; 8UIY/KA; 8PME/J; 8UDF/K7; 8RUO/J; 8VOK/KB6; 8RHU/KA; 8CJR/XU; 8QDU; 8HGW; 8KAY/6; 8HRV; 8JMP; 8HUD; 8OFN/8; 9WUG/KB6; 9PMA/K6; 9EWY/VS; 9TQD/J; 9JYF/J; 9DPZ; 9HEA/J; 9QMB/?; 9JMG/K6; 9IIL/K7; 9PFP/KB6; 9LAL/KA; 9CHZ/KA; 9YXO; 9GRV; 9TLL/K6; 9BOA/KA; 9FS; VE4APM; VE4RO; VE5ADI; VE5AAD; VE5UH; VE5KH; VE5ZM; VK2DI; VK2DJ; VK2GU; VK2KR; VK2NO; VK2VT; VK2HG; VK2AHA; VK2TC; VK3CP; VK3KX; VK3MC; VK3TC; VK3VD; VK3JT; VK4HR; VK5QR; VK5KA; VK6FL; VK6LW; KA1RO; KA1JB; KA1AF; KA1LL; KA1JM; KA1JN; KA1AB; KA1SC; KA1FM; G2AJ; G2PL; G2TA; G5BJ; G5LP; G6CU/ZS; G6RO; G6CJ; G8IG; G8RQ; VS5JH; VS6GY; VS6DY; LU9AX; LU7AZ; CX2CO; XE1OQ; D4ABC; VU2BG.

Edward G. Raser, W3ZI, 315 Meechwood Ave., Trenton 8, N. J.
March 1946
(14 mc)

XE1AM; XE1CM; HK1AB; CO2RZ; D4USO; D4USA; F8AZC; F8ABC; HB9CX; HB9CE; HH3PC; HH3PY; CX1NE; LM2A; KZ5AA.

(28 mc)

FA8NF; EK1IND; ZS6QU; G2HK; G2HM; G2PU; G40C; G8LT; G8TH; GW2GW; GW6JW; D4AGI; D4AAX; D4ADQ; D4ADL; D4ABT; D6QB; TG9JPM; TG9WPZ; TG9WBB; TG9WTB; TG9PB; TG9JW; OA4AG; OA4AX; LU7AZ; XE1AJ; XE1JF; XE1A; XE1B; VO1Y; W2KGW/VO; VE2AC/VP2.

Alois Weirauch, OK1AW, Mestec Kralove, 9, Czechoslovakia
March 5 to 20, 1946
(28 mc c. w.)

W 1BPX; 1CH, 1LCH; 1MDK; 1NW; 2FQS; 3BES; 3EHW; 4AKH; 4AOK; 4DKA; 4EGH; 4GOG; 4YA; 5HP; 5KGN; 6IOJ; 6QKB; 8ABM; 8OFN; 8SSD; 8WWF; 9ABE; 9YDD; W20AA/J8; VO1S; VE1EA; VE1KN; VE1LZ; VE1EP; VE1KU; VE1FB; ZS5B; OQ5BQ; OQ5AQ; VU2BG; KF6SJJ/W1; XU1YO; XU1YV; XU1YY; CS7P; K4ESH; LU3DH; D4ADW; ZS6DW; ZS2X; ZD4AB.

(28 mc phone)

W1 CBS; 1MDK; 2HGI; 4EGH; VE2HE; SU1USA; SU1MW.

(14 mc c. w.)

PY6AJ; PY2KD; PY7AD; PY1AJ; PY2TI; PY2KT; PY6AW; PY2AY; PY1GS; PY4FD; LE8EE; LU1OA; LU2FC; LU1CA; ZP6AB; VS6GT; VS6DY; PK3MR; CE3AG; EP1C; ZP2AC; HZ2YY; TF1AA; CX1NE; YV5AN; OQ5AQ.

Philip Patterson, 2410 West 4th, Amarillo, Texas
February 9 to April 2, 1946
(28 mc)

FA8NF; LU7AZ; LU3DH; KA3CD; KA1AF; VK2GU; VK5BG; ZL1GI; Portable Guam Is.: W3EHD; W9WUG; W6QKB; W2KQT; W9YM; W9CBO; W6PKP; W7GXR; W9WFW; Portable Tinian Is.: W5DBT; W6MBA; W6PUZ; W5GXX; W6PCK; Portable Okinawa Is.: W8SHY; W6NFL; W6KBH; Portable Iwo Jima: W6PZE; W7ELL; Portable Aleutian Is.: W9IIL; W6QJW; W9QMD/KE6; W6UFV/KA.

Harold Ryall, W1NKW, 72 Bowler Street, East Lynn, Mass.
March 17, 1946
(28 mc c. w.)

G2CV; G2FM; G2QO; G2YB; G3GC; G3GF; G3PQ; G3QQ; G5LC; G6JX; G5RY; G5TZ; G6OV; G6RB; G6SQ; G6VQ; G6ZO; G8IP; G8TR; G8QZ; EI9N; ZS1B; ZS2X; ZS2AL; D4AIE; D4ADK; FA8NF.

[*Continued on page 58*]

CQ DX

By HERB BECKER, W6QD

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

By the time you read this department in the May issue probably many of you will have worked as many countries and zones as your pre-war total. Of course, this is a little exaggerated but, at the rate many of you DXers have been knocking off the countries, it shouldn't be too long. Incidentally, while we're on the subject of pre-war versus post-war totals for countries and zones, it looks as though the field is pretty well divided in opinion. Some hate the thought of not being credited with their pre-war country totals while others think it would be much more fun for all concerned to start from scratch. For the time being, at least, we are going to kick it around until we get a few more expressions of opinion. Frankly, I think we will probably wind up in showing both the pre-war and post-war totals, thus satisfying all factions as well as giving the boys with the pre-war totals as a sort of goal to shoot for. Enough of this chit chat—on to the DX.

We can't proceed very far into this column without saying that old Frankie Lucas, W8CRA, is back on the air with his usual line of DX chatter. For the moment Frank is somewhat handicapped in spending much time on the air due to his station being still located in Canonsburg while he is now living in Pittsburgh. While we're in the 8th District, a line from W8BKP indicates that he is well active on the 10 meter band, as is George's son, George Jr. From the looks of things they have worked 41 on phone and 26 on c.w. Transmitter is running 90 watts to a T55 and the receiver is the same National NC-100. The antennas in use are 3, a Lazy "H", a 3 element close spaced beam which is fixed on Europe, and a Bi-Square. George Jr. has sent in a list of good stuff he has worked but, with no frequencies listed, there's no point in showing it in print.

W3EHW has worked a few pretty good ones, W9JKD/J3 in Tokyo, 28040 kc, W6PUZ on Tinian, 28020, and 0Q5BQ, who is ex-ON4MT. The full QTH for the latter is Maurice Plumen, Box 222, Leopoldville, Belgian Congo. Also worked by W3EHW was ZC6NX on 28685.

W9KA wants us to continue with WAZ rather than start all over from scratch, the same for countries. Roy was building a new rig just prior to the war but never got a chance to use it. Now he's starting to build up all over again. Swell hearing from this guy again!

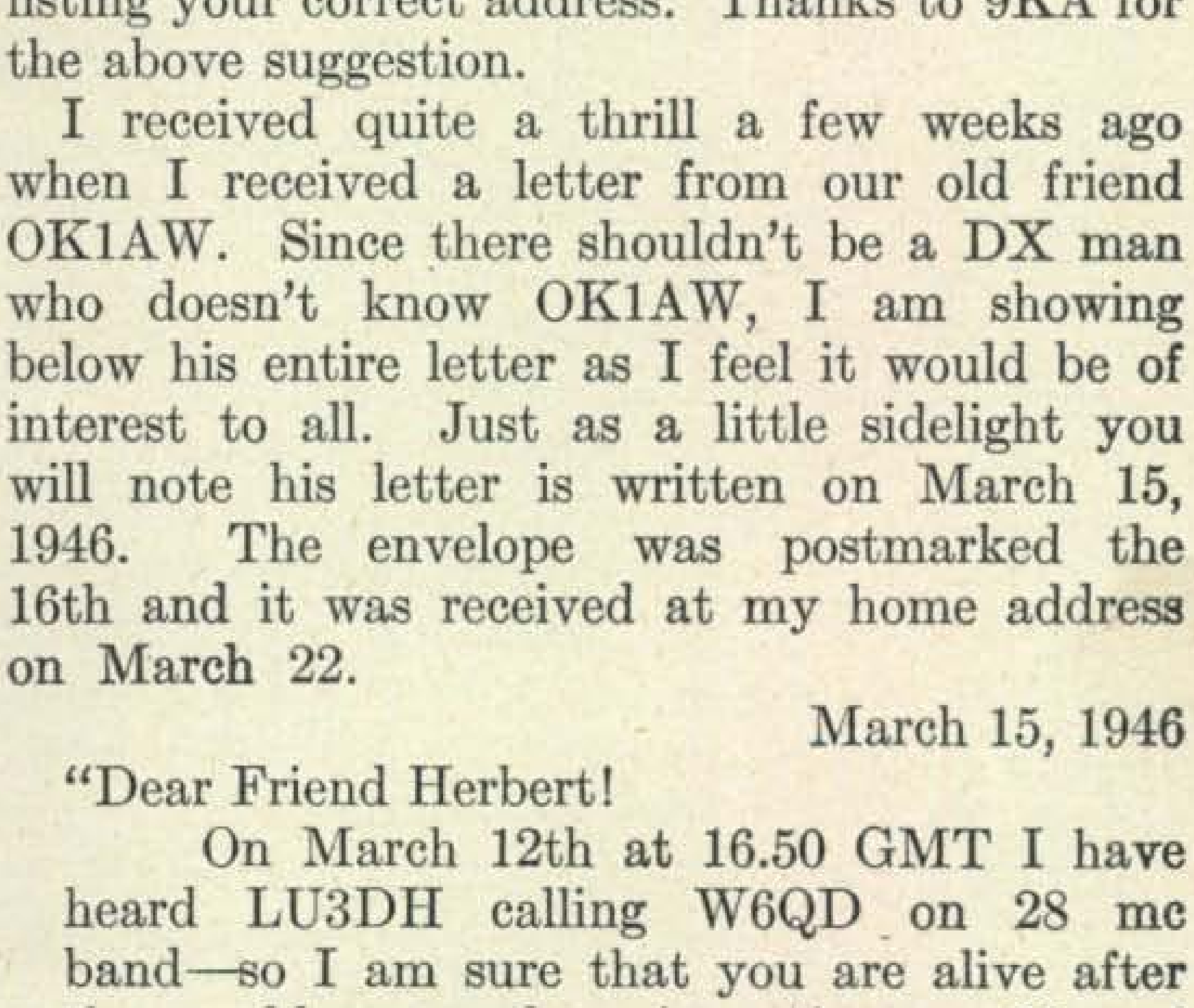
Any of you fellows who have changed your QTH since the last Call Book was published would be doing all the other hams a favor by writing in immediately to "Radio Amateur Call Book, 608 So. Dearborn St., Chicago 5, Illinois," listing your correct address. Thanks to 9KA for the above suggestion.

I received quite a thrill a few weeks ago when I received a letter from our old friend OK1AW. Since there shouldn't be a DX man who doesn't know OK1AW, I am showing below his entire letter as I feel it would be of interest to all. Just as a little sidelight you will note his letter is written on March 15, 1946. The envelope was postmarked the 16th and it was received at my home address on March 22.

March 15, 1946

"Dear Friend Herbert!

On March 12th at 16.50 GMT I have heard LU3DH calling W6QD on 28 mc band—so I am sure that you are alive after the world-war and again active on 28 mc! Our last letters were changed about 7 years ago—and now I'm trying to write and hear



"Personally, Herb, I think you're letting this DX business go to your head."

from you again. I hope your QRA is same as before.

As you see I am alive too, after the German occupation of our country. But my radio-rigs were confiscated in March 1939 by German police. Then I was badly ill in year 1942, but now I am again well. During the war I was listening on short waves and informing my friends about news etc. As you know short wave coils were revoked in all the BC1-receivers and it was allowed only listen to German stations! But for us amateurs it was easy to listen on s.w., after a very simple application on superhets, and I was listening on a very small sw rx with twin triode 19 with 20 vlts on the plate, hi. Now we can again free listen for foreign stations and s.w. But we are still QRT, our licenses not yet back. We hope to get our licenses again in near future, but probably first on 28 and 56 MCs. So I can only listen at present and have heard many W12345689, VE123, LU, CE, ZS, SU and so on on ten.

NW qru, and hope to hear from you soon! And if you are still active in RADIO editory, I send "Calls heard" for your magazine."

(Signed) Alois Weirauch
OK1AW

For your information, the following is the address of OK1AW: O K 1 A W, Alois Weirauch, Mestec Kralove, 9, Czechoslovakia.

W6NNR is doing a good bit of phone DX work, having recently passed his 40th country. Some information which should be of interest which he has worked include XABZ 28200. He is located near Naples, Italy. For QSL purposes he can be addressed: Lt. E. R. Gaul, W6PXQ, 2075 N. San Antonio Avenue, Pomona, California. Then there is W6RJG/J9 28500 located on Carlson Island, which is near Kwajalein in the Marshalls. He is supposed to be the only station on in the Marshalls or Gilberts. QTH: Robert M. Lee, RT 2/c, USNAB #824, FPO, San Francisco. Another good one is D4ACE 29060 in Frankfurt, Germany. He is W7HQC. Robert H. Dempsey, Co. A, 3112 Sig. Svc, BN, APO 757, c/o Postmaster, New York, New York. D4AFE 29160 also in Frankfurt is W8WUL, Walter C. Marsh, same QTH as D4ACE. W6NNR also reports TG9AW, Jack Whitehead, Aviateca, Guatamala City, Guatamala. Also in the same town is TG9WPB, Paul Boyer, Pan-American Airways. Another one in Germany, D4AEY 29000 located in Mannheim. He is Bill Sexton, Headquarters C.C.A., 1st Armored Division, APO 251, C/O Postmaster, New York, New York.

Here are a few other stations worked by Guy Dennis, W6NNR. G6CU/ZC2, 28020, Cocos Island, Indian Ocean; W4YA/XZ, 28030, near Lashio on the Burma Road; VE8AR, 28100, Whitehorse, Yukon Territory: VS1RP, 28950, and located in Singapore. (This is a nice juicy one for you fellows.). XU1YA, 28040 in Tientsin, China; XU1YU, 28059 in Tsintao; YU1YV, 28090, Tsintao; W8CTR/XU8, Shanghai, OQ-5BQ, 28050, Leopoldville, Belgian Congo; XAAF, 29000, Naples, Italy, and we can't overlook our old friend, George Gray, VK4JP, 28030. George was in the States prior to the war and many of us became very well acquainted with him. Guy also has worked a number of others which we'll not go into at this time, but I would like to add that all of the above were phone contacts, none of them being raised on CW.

There are a number of other W6s doing good phone DX, including W6PDB, W6LEE, W6PNO, W6JJU, W9ANS/6, W6POZ, W6AM, W6OZH. Ken Moore, W6PDB, gives a number of stations and some frequencies—W4HLO/J9, 28440, Marshall Islands, W8WSG/ZC3 on Christmas Island, 28480, VP9F, 28090, W1NQ and W6MZS are working portable on Okinawa, as is W2JE, 28100. W7ELL, 28185 is on Iwo Jima; W5HIO is alos there. Then there is XABZ in Italy, 28110. PDB also reports hearing but not working FK8AN, 28080, on c.w.

Speaking of c.w., here are a few others which may be of interest. XU1YO, 28100, XU1YY, 28080, W9JKD/J, 28035, VP6JR, 28530, W2OAA (Korea), 28342, PJ3X, VE5AJE, 28060, on Falkland Island, and FN8AC, 28080.

W2IOP, Larry LeKashman, finally got something on the air and worked LU7AZ. Larry, you know, is editor of this mag, and being an old DX man himself I don't think we'll be at a loss for space in this department

W9EGQ (I knew we'd get a W9 in here somewhere), Herb Brier has been doing a swell job rounding up some stuff throughout the Middle West. Most of the following will be actually quoted from 9EGQ's notes since they are written very completely.

"Anybody can work DX with a KW, but who's doing it with low power?" We've all heard that question; so let's see what W5KC does with 60 watts. He starts out with W9QCJ/KB6, Tinian, 28050; W8KAY/KB6, Saipan; W9QMD/KE6, Johnston I.; W6HQN/J Japan, 28100; OQ5BQ, 28015. While you figure how to drop your input to 60 watts, you might like to drool over a few more: VQ3TOM, Tanganyika, 28025; VE4AF/VP8, Falkland I.; PJ3X, 28000 and FA8B. They are worth getting the key out for.

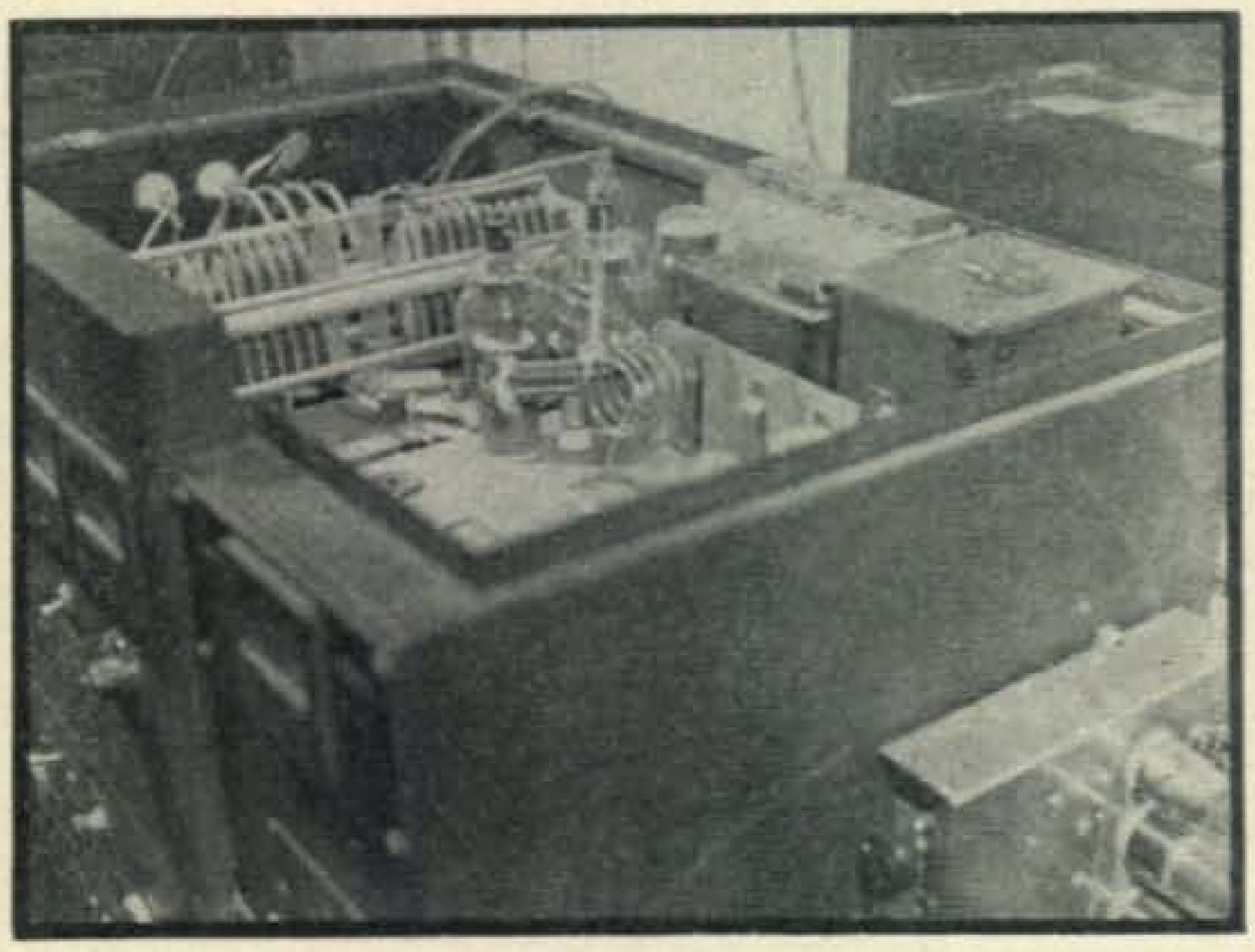
W9RMN lists a few on phone: XABZ (Italy); G6TL, W9KLE/K6, GM3YS, EI2M, HK3AB, GW5XN, LU7AZ, EK1IND, VK2AOP, ZS6DW, plus dozens of G's, VO's, etc

Don's antenna is unusual. It is 5½ waves long, fed in the center with 300 ohm line. The unusual part is that the center half wave is a conventional folded doublet.

W9RRX works some nice ones on phone, too. His four wave per leg rhombic is aimed at Europe, which will interest the boys in the Chicago area, because Bob works them in all directions. His first DX contact with it was with LX1SI for an S9 report, followed by contacts with F1USA, FA8NF, HC1JW, W8-BOR/PY (now gone home), and CE2CE, CA4M, ZS2AZ, GW8UH, W6PUZ/KB6, Tinian; W6PKP, Guam; VK5BF, W6GIA, Isle of Man; LA6YP, SU1USA, OZ5BW, and others to the total of over 30 countries. Among the bunch not listed are 40 G's and 23 D's.

W9KP uses six element Sterba curtains for antennas, and is frequently reported as the loudest station on the band. Among the other beams tried the rhombic is the only one to approach the "curtain" but takes up much more room. Among Jack's 37 countries are the following: W1NSW/J5, Okinawa; VP3LF,

(Above) W. B. Martin, W3QV, now on the air as XU1YV from Tangku, China. (Below) The rig at XU1YV is a modified BC-610



28,240; LA4P, LA3CA, YR5B, YR5X, SU1MW, W9IIL/K7, Shemyu, Aleutians; OQ5AQ, HB9-CX, ZS2AZ, ZS4AA, ZS6AM, ZS1T, ZS4H, VK4JP, D4USB, D4ACD, D4ADD, D4AIE, OZ2M, CZ7CC. Jack works both phone and c.w.; so there is no way of telling how many of the above are phone work.

W3FQP got on ten the first day, but it was late in December before he worked his first DX station. Since then the total has risen to 46 countries, and a couple WAC's. His best ones are; XU1YV, W9DCH, Iwo Jima; W2OAA/J5, G6CU/ZC2 (Why can't I work ZC2?) and LI3JU. After those it is probably just another contact when W3FQP works W6QKB/KB6. W6MBA/KB6 (Tinian), W9QMD/KE6, PJ3X, SU1USA, VK4JR, FA8JD and VQ3TOM, but they do look nice in a log—especially when its your log. HP1A has been heard, but not yet worked.

W9TAL is modest; he only mentions his last DX contact, which was YV5AP, 28010 c.w.

W9IU has upped his post-war total to 45 countries and 24 zones by working TA1AF, 28125, T6; HC1JW, 28050, T9; HH2G, 28010, T9; W2KQT/KB6, 28000, T9 (Guam); PY2AJ, 28250, T9; CX1FB, 28040, T8; VQ3TOM, 28015, T9 and VQ2PL, 28090, T9. He gives 28015, T9 and VQ2PL, 28090, T9. He gives the following DX frequencies: LA20A, 28450, T9; OZ3FL, 28055, T7; YR5X, 28080, T9; W7GXR/-KB6, 28030, T9, W9DPZ/KB6, 28045, Y9; LU5BT, 28020, T9, HH5PA, 28200, T9; and D2XZ, 14035, T9. (How did he get in there?) If you don't think W9IU has been a busy boy, read this. On March 22, he worked his 100th G, and claims the record of the first W9 to have done so. G5LK was the lucky station; bucky because W9IU presented him with a new call-book. Les plans on giving every 100th DX station he works a call-book. At the rate he has been working them, that will be a call-book a week at least.

W9HKR proves that IU isn't the only fellow in Kokomo who can work DX by reporting QSO's with LX1BB, whose T5 signal was wandering over 30 kc at the hi-frequency end of the c.w. band, SU2GV, 28070, T9, and XACR, 28010, T9. Don't pass by XACR, because stations in Greece aren't that plentiful. Ev has 27 to his credit. He runs 300 watts on c.w. and 150 on phone to a four element rotary.

W9HUV reports PJ3X on 27990 with a T7 or T9 signal, PY5AF, 28125 T9, and K7QI, 28030, T9. Bob is working on a super-secret DX antenna.

March 29 saw the return of the ZL's to the air. W9MVZ reports that conditions were perfect for their debut. Of the many he heard, ZL2BE, 28450 was the best.

[*Continued on page 48*]

Parts and Products . . .

ALSIMAG BOOKLET

A widely illustrated, 8-page two-color booklet directed to the average engineering student, radio amateur, and radioman has just been issued by American Lava Corporation of Chattanooga, Tennessee.

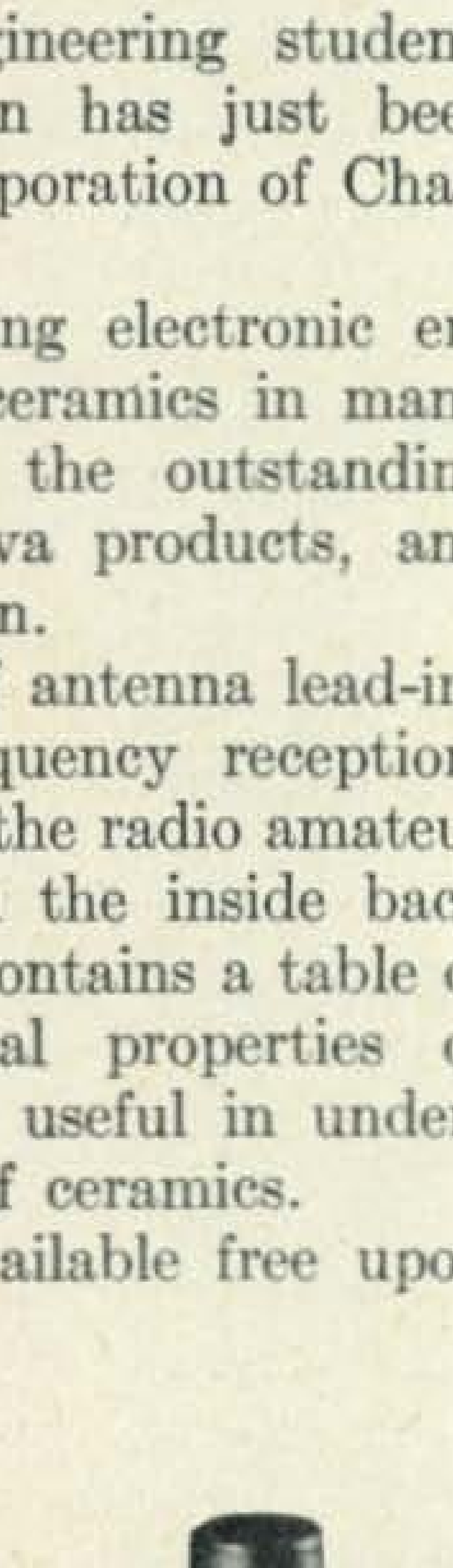
Realizing that the impending electronic era will see an increased use of ceramics in many forms, the bulletin includes the outstanding features of AlSiMag and Lava products, and general engineering information.

Data on the construction of antenna lead-ins for ultra and very high frequency reception, which should be of interest to the radio amateur and experimenter, appears on the inside back cover. The back cover itself contains a table of the mechanical and electrical properties of AlSiMag, which should prove useful in understanding the general subject of ceramics.

The Bulletin No. 545 is available free upon request to the factory.

HEAVY DUTY 812

United Electronics Co., Amateur Radio Department, Newark 2, N. J. has announced two new amateur type tubes designed as high power renewals for soft glass tubes with 6.3 and 7.5 volt filaments. They are especially desirable as replacements for tubes of 40 to 55 watts plate dissipation. Installation in existing rigs requires little or no revamping. Other features are grounded tungsten seal rod; Zirconium impregnated graphite anode; genuine India lava; patented getter trip giving a crystal clear envelope; Nonex hard glass; and high grade ceramic base insert.



NOISE LIMITER

A double-ended series valve noise limiter which clips both the positive and negative peaks off noise pulses has been developed by the National Radio Company for use in the Company's HRO receiver.

Sought by amateurs for several years, the new noise limiter is the first of its type developed for general commercial sale. It gives the operator far more signal for any given amount of noise and thus will be particularly useful for either code or phone reception.

Another panel control will be added although there has been no change in the basic design of the HRO. Since the limiter controls the threshold or level at which the limiting occurs under this new arrangement, the operator can adjust it for optimum performance.

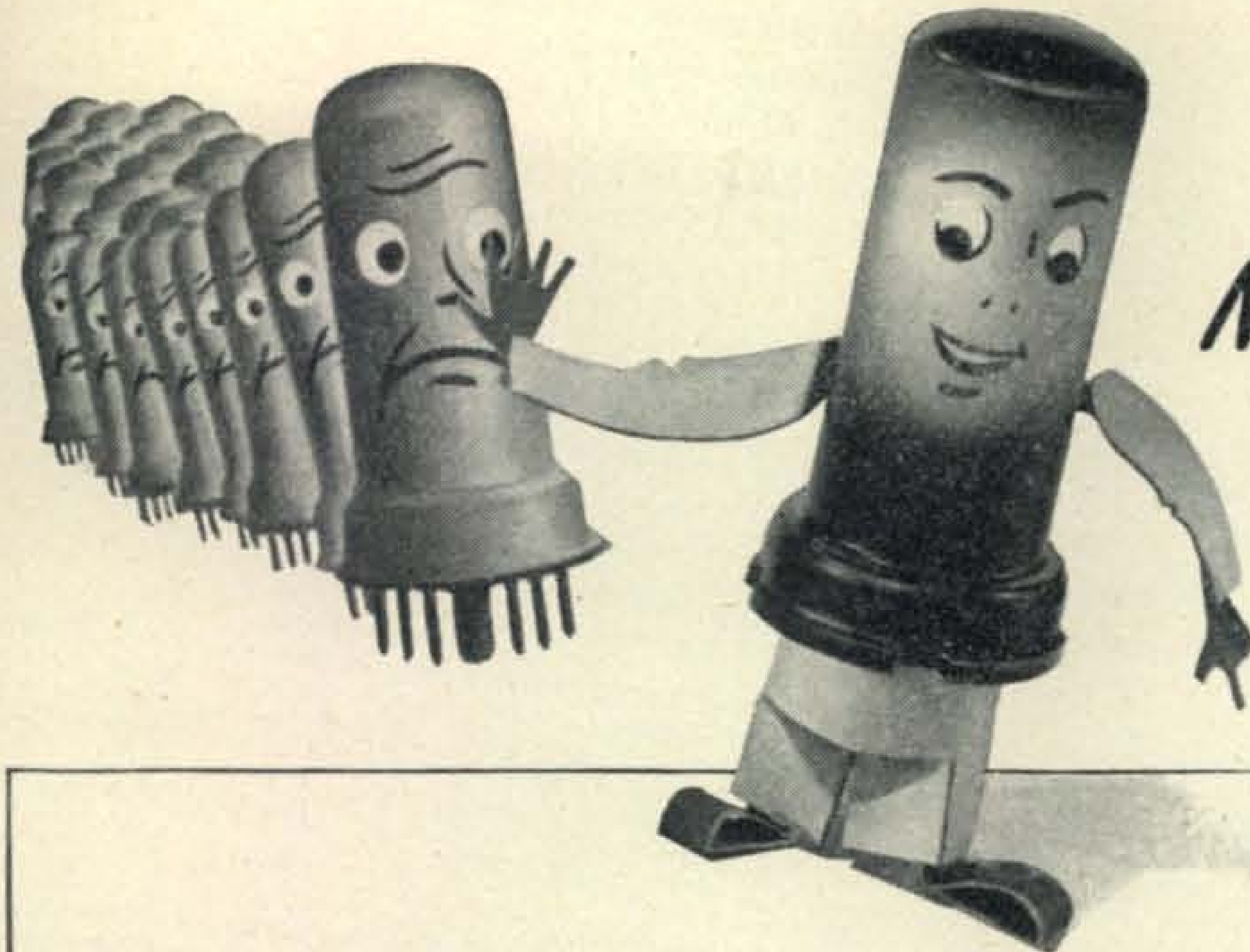
Operation of this double-ended series valve noise limiter was made possible by the use of an impedance-matcher developed during the war which can be connected to a high impedance circuit and look into a low impedance circuit without diminishing the normal gain appreciably. As a consequence, no additional amplification stages are required.

GROUND PLANE ANTENNA

The Andrew Co. of Chicago, manufacturers of coaxial cable, antenna tuning equipment and high frequency antennas, is offering a new Ground Plane Antenna for the amateur, which is very efficient, easily mounted, and attractive in price. The antenna is designed for use with 50 ohm cable and provides a light weight easily installed radiator for the high frequency amateur bands. Models are available for use in the 10 meter, 5 meter, or 2½ meter bands.

One of the outstanding features of this antenna is the universal mounting bracket which provides easy mounting to a chimney corner, wooden pole, or building corner without additional hardware and tools. The total weight is 18½ pounds, including a 50 foot length of solid dielectric cable, which makes it possible

Type	Filament		Max. Plate Dissipation	Capacitances $\mu\mu f$			Max. input per tube	Max. Plate	
	Volts	Amps.		cgp	cgf	cpf		Volts	Mils
V-70-D	7.5	3.25	85 Watts	4.5	4.5	1.7	300 Watts	1750	200
812-H	6.3	4.0	85 Watts	5.3	5.3	0.8	300 Watts	1750	200



NOW- REPLACE OVER 875 TYPES OF BALLAST TUBES WITH ONLY 10 N. U. UNIBALLASTS

N. U. UNIBALLAST

COVERS YOUR REPLACEMENT NEEDS WITH ONLY 10 FAST-SELLING PROFITABLE TYPES

YOU BET UNIBALLASTS are a real profit-maker for service men. With only 10 types of N.U. UNIBALLAST to carry, you keep your investment constantly turning, and putting profits in your pocket. Order UNIBALLASTS today from your N.U. Jobber. And ask him for the "N.U. UNIBALLAST Service Manual" or write—National Union Radio Corporation, Newark 2, New Jersey.

SPECIFICATIONS

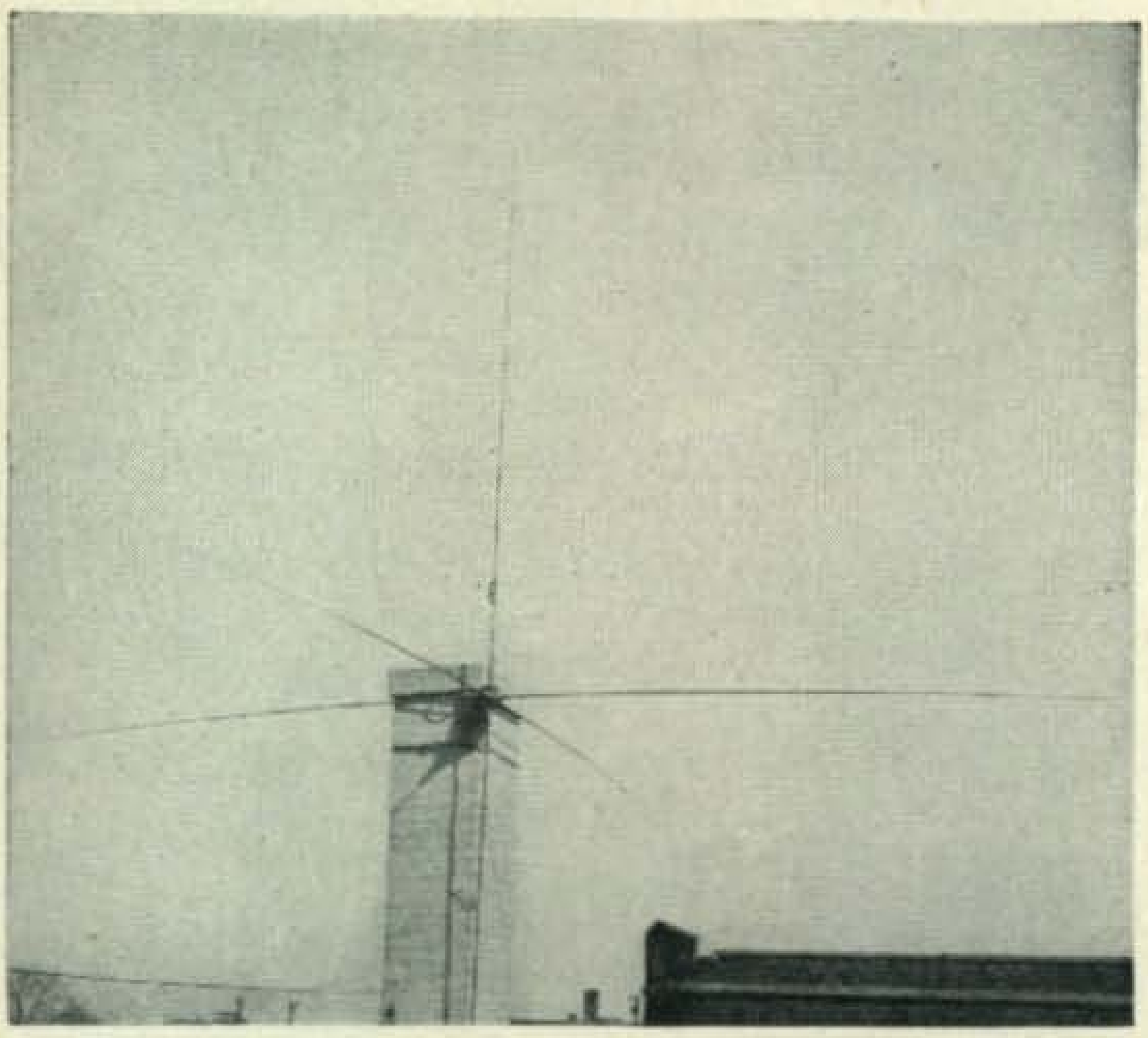
- UNIBALLAST—the universal ballast tube—small—compact—easy, quick in-installation.
- Metal envelope is excellent heat radiator. "Plug-in" simplicity.
- Provides proper operating current conditions regardless of variations in line voltage and in the characteristics of tube heaters and pilot lights.
- Even if one or more pilot lights burn out UNIBALLAST continues to operate the tube filaments in the string, at efficient current range.
- Resistance is self-compensating—adjusts itself automatically—true ballast action. Voltage dropping range is indicated on every UNIBALLAST.

NATIONAL UNION RADIO TUBES AND PARTS

Transmitting, Cathode Ray, Receiving, Special Purpose Tubes • Condensers • Volume Controls • Photo Electric Cells • Panel Lamps • Flashlight Bulbs

Actual size
Ov. Length 3 1/8"
Seated Ht. 2 11/16"
Diameter 1"

Order Today from your N. U. Jobber



to carry the antenna up to its mounting position. The above photograph illustrates mounting methods and shows a close view of the rigid construction. An extension cable kit is also available for tower installation where 50 feet of cable is insufficient.

MULTI-ELEMENT TRIODE

A new type 3-150A Multi-element triode is announced by Eitel-McCullough, Inc. The characteristics of this new vacuum tube make it suitable for many applications, including high frequency amateur transmitters. The 3-150A incorporates a new design plate and a non-emitting grid, which insure maximum tube life plus high efficiency.

The 3-150A is available in high mu (3-150A3) or low mu (3-150A2) versions, and includes a number of important engineering improvements. Data sheets are available upon request from Eitel-McCullough, Inc.

Radio Frequency Power Amplifier and Oscillator Class-C* Telegraphy

(KEY DOWN CONDITIONS WITHOUT MODULATION)

	Typical Operation— 1 Tube			*Max. Rating*
D-C Plate Voltage..........	1500	2000	3000	3000 volts
D-C Plate Current..........	333	300	250	450 ma.
D-C Grid Current..........	58	74	70	85 ma.
D-C Grid Voltage..........	−125	−200	−300	volts
Plate Power Output.........	350	450	600	watts
Plate Input.................	500	600	750	watts
Plate Dissipation...........	150	150	150	150 watts
Peak R. F. Grid Input Voltage, (approx.)................	267	334	410	volts
Driving Power, (approx.)....	13	20	27	watts

*THE ABOVE FIGURES SHOW ACTUAL MEASURED TUBE PERFORMANCE, AND DO NOT ALLOW FOR VARIATIONS IN CIRCUIT LOSSES.

MINIATURE DUPLEX DIODE HIGH MU TRIODE

National Union Radio Corp., Newark, N. J. have released data on two new miniature tubes. The NU-12AT6 is a miniature high Mu triode having two diodes. The applications and electrical characteristics are similar to type 12Q7GT and the tube is intended for use as a combined detector amplifier and AVC tube.

The NU-6AT6 is the 6.3 Volt, 300 ma version of the NU-12AT6 and is particularly designed for AUTO RADIO or portable-mobile applications.

RATINGS:—

Heater Voltage	12.6 volts
Heater Current	.150 amps
Plate Voltage	300 volts max.
Peak Heater Cathode Voltage	±90 volts max.

INTERELECTRODE CAPACITANCES:—

Grid to plate	2.1 uuf
Grid to cathode	2.3 uuf
Plate to cathode	1.1 uuf
Diode plate No. 2 to triode grid	1.025 uuf

PHYSICAL SPECIFICATIONS:—

Mounting Position	Any
Maximum Overall Length	2⅛"
Maximum Seated Length	1⅞"
Maximum Diameter	¾"
Bulb (Glass Miniature)	T-5 ½
Base Miniature Button	7-Pin
Base Designation	7BT

Base Connections

Pin No. 1—Triode grid	Pin No. 5—Diode Plate No. 2
2—Cathode	6—Diode Plate No. 1
3—Heater	7—Triode Plate
4—Heater	

CATALOGS

Allied Radio Corp., Chicago 7, Ill., have announced publication of a new 1946 catalog. Over 10,000 items are listed including the complete lines of most amateur parts and set manufacturers. A copy will be sent without charge upon request to Allied.

A thirty-six page catalog for engineers and experimenters, featuring the companies entire switch line, is announced by Centralab, suppliers of variable resistors, sound projection controls, capacitors, switches, trimmers and ceramic bodies. The switch catalog has been keyed to the manufacturers who require switches engineered to specifications so will be of limited use to hams, but those in need of such data may secure a copy by requesting bulletin 722 from Centralab, Milwaukee 1, Wis

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Hytron Radio and Electronics Corporation have released a new catalog of their special purpose and transmitting tubes. Copies may be secured from local jobbers or by writing directly to Hytron, Salem, Mass.

Eitel-McCullough, Inc., manufacturers of radio transmitting tubes and electronic equipment have prepared an illustrated brochure. This new booklet illustrates and describes the complete line of Eimac vacuum tubes, including: triodes, tetrodes, rectifiers, vacuum capacitors, vacuum switches, and diffusion pumps.

Copies of the booklet may be had by addressing the Sales-Engineering Department, Eitel-McCullough, Inc., San Bruno, California.

VOMAX

PROOF CONVERTS A DOUBTER

We admit that our advertising of "VOMAX" describes the "one and only" . . . a v.t. multi-meter so new, so modern that it tops the list. Yet we know our each and every statement to be hard fact. Writes a converted "doubter:"—

> ". . . I would not part with VOMAX for any money . . . I read with considerable interest your articles in July and August QST 'Taming the Vacuum Tube Voltmeter.' Your claims as to this instrument's ability as a Dynamic Signal Tracer were taken with a grain of salt, however, because I had considerable experience using the vacuum-tube voltmeter as a signal tracer and in most cases results were far from satisfactory. I have used the "VOMAX" as a signal tracer on several jobs and am more than pleased with the results . . . I was also pleased to find the instrument so stable and free of zero shift. This stability was another of your advertising claims which I took with a grain of salt. (Signed) A satisfied serviceman, Clarence F. Hartzell, Altoona, Penna."

If that isn't proof to the hardest boiled technician, may we mention "VOMAX" order and *re*order by the U. S. Bureau of Standards? And as a clincher, you know that when your jobber is enthusiastic, it's because he has something of *real value* to you.

Say all eight New England stores of Hatry & Young; Radio Wire Television; Radio & Appliance Corp. of Nashville: "We and you, our customers, have waited a mighty long time for . . . 'VOMAX'—it's *more* than we expected."

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Letters

New Rochelle, N. Y.

Sirs:

Certain ham practices on phone should be more or less regulated under a code of rules of etiquette promulgated by the hams themselves and that code should be the duty of the hams to live up to in their everyday contacts on the air.

I have reference, first, to the calling of CQ. It is my belief that an operator should not call CQ until he has first tuned the entire band and ascertained whether or not someone else is calling whom he would care to contact. Then upon calling CQ the operator should interpose his own call at regular and frequent intervals between the CQ's. A fair average on "phone" is 6 CQ's to one call sign. This would prevent someone who is tuning the band from having to stop and wait, what seems to be an interminable period, before he discovers whether, for example, he is listening to DX or a local station, as well as forcing other answering operators to make their replies unduly long.

The above can also pertain to the operator who answers. If he repeats his own call at regular and at not too long intervals between the call of the station being called, it would also enable the one who made the CQ to quickly choose the station he wished to answer.

Now, if the CQ's and answers are made as above, then there is one more thing necessary. That is: not to draw them out unnecessarily. One, two or three short CQ's will get better results than one very long one, because an answer may be received on the first or second, thus time will be saved. Likewise with the answer. It should not be too long—of course longer than a CQ—but that, too, can be divided and generally into two parts. If he doesn't come back on the first try, try once more.

The next thing to be considered in the rules of etiquette should be the length of each transmission. It should be understood that if you want to get back the full answer to your questions or reply to your remarks, you should not ask a number of disconnected questions or make a multitude of heterogeneous remarks in the same transmission. This will greatly speed up QSO's and enable one to make more contacts more pleasantly.

One suggestion is to always have a pad of paper handy to jot down any question which comes to your mind or any question which requires an answer in your next transmission.

All this is only a part of what a code of rules of etiquette might involve, but it all attempts to give added space in bands that are and will become constantly more crowded.

Gay E. Milius, Jr., W2NJF

Bethesda, Md.

Sirs:

Ten meters, the band which probably has given the writer more thrills than any other over the past 15 or 20 years, now carries the greatest part of the

UNITED *Announces*

THE GREATEST DEVELOPMENT IN GRAPHITE ANODE TUBES!

Forecasting Higher Input and Efficiency Ratings

It is the consensus of opinion among electronic engineers, as a result of war experience, that graphite is superior to metal for internal anode tubes because of *unsurpassed thermal and non-warping properties.*

Heretofore, the enormous heat dissipating capacity of graphite anodes has been impeded by the use of free getters which deposited heavily on the bulb and tube elements.

The development of the *Isolated Getter Trap* by United has finally eliminated this long standing barrier to the full utilization of the superior features of graphite.

Gas content of these new United graphite anode tubes *average lower than that of any metal anode tubes of comparable size, and no gas can be liberated even on severe overloads.*

Available now with this new construction are types; HV-18, KU-23, 849, 838, 204A, 949A, 949H, V-70-D, 812H, and all of the diathermy types.

Order direct or from your Electronic Parts Jobber

LOOK FOR THIS "GETTER TRAP" on all UNITED TUBES

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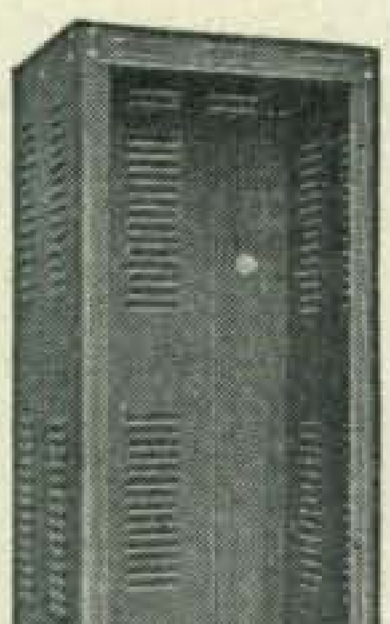
Transmitting Tubes EXCLUSIVELY Since 1934

loose radio equipment is DANGEROUS!

Insure yourself against embarrassing and disastrous accidents by housing your rig in a BUD rack. *B*eauty, *U*tility, and *D*ependability spell BUD and ends your accident worries.



This cabinet rack is built of heavy gauge steel and features welded supports on bottom so that casters can be installed, if desired, allowing ease of movement and ready accessibility to the rear with a minimum of effort. Finished in black or grey crackle with a size for every application, this is a "ham shack must."

BUD
BUD RADIO, INC.
CLEVELAND 3, OHIO

burden of amateur radio communication. A few days ago, a W3 was heard to complain about the band, claiming that short skip is too unpredictable, and that long skip seems to come and go so that a contact may or may not be a satisfactory one. Yet that same W3 has been called by DX stations in answer to his "CQ DX," and he seems to be working everybody. A bit of power plus a rotary beam does the trick. We'd gladly trade stations with him if we could.

Here in the Washington area, however, there has seemed to be relatively little ground-wave DX, a type of ten meter communication that requires a combination of power, technical ability and patience that is very much like similar problems on five meters before the war, and the thrills can be just as great. We do not hear Washington stations talking with Baltimore, Wilmington, and Philadelphia on 28 mc.

About ten years ago, when using the call W9FM or W9BNX, we once put up a number of vertical elements to "soup up" the signal on 28 mc. for an Aussie contest. Immediately, it was noted that signals from Milwaukee, Bloomington, and W9HAQ in Davenport, Iowa, were heard on ground wave at the Wheaton, Illinois, location just west of Chicago. In a nearby location Rex Munger, W9LIP, of Taylor Tubes who is a friend of mine recently wrote me:

"I am really having a world of fun working long range ground-wave DX at night. So far, I have been able to work into Fort Wayne, Indiana, over across into South Haven, Michigan, South Bend, Peoria, Freeport, Rockford, Oglesby, Milwaukee, and a station in West Bend, Wisconsin, which is 30 miles north of Milwaukee. It is really a lot of fun and I am very pleased with the results that I am getting . . . . ."

Have you tried these ground-wave-DX contacts too? Make some schedules with fellows—particularly those with beams with the same antenna polarization—and see if you can do it. Really, it's like squeezing South African contacts out of the band when it's open!

Comm. E. H. Conklin, W3JUX

Book Marks

Televison Simplified by Milton S. Kiver, published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 375 pages, cloth binding, $4.75.

Television Simplified is a good book for the amateur who wants to know in a general way how television circuits operate. It is a non-mathematical treatment.

The book contains fourteen chapters, a glossary, and a good index. It is amply illustrated with typical circuits for which operating values are usually not given.

Topics range from antennas and wide-band circuit considerations through amplifier and syn-

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73 de

Bill Harrison, W2AVA

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New improved 144 Mc. transmitter-receiver in stock. Less accessories. **$43.00**

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Panoramic tuning adaptor. Easily ttached to any standard communications receiver. Harrison has it! In stock. **$99.75**

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Complete with tubes, speaker in metal cabinet and instruction manual —ready to operate on 115 volt 60 cycle AC.

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Totally enclosed motor and gear box. 3 RPM right angle drive shaft with ball thrust bearing. Runs on 24 to 30 volts AC or DC. Single wire reversing. Light weight aluminum construction, 3¾ lbs., 5¾" x 3¾" x 5" overall. Plenty power for 2 or 5 meter beam. Surplus Navy Material—brand new! **$14.90**

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Six acorn tube RF circuit, four IF stages. 115 volt 60 cycle operation. Chassis 10½" x 25½", in metal case. Complete with tubes: 5 — 954, 1 — 955, 4 — 6SK7, 2 — 6SJ7, 2 — 6N7, 1—5T4.

Full instructions and diagrams for easy conversion to a *hot* 10 (also 6 and 2) meter superhet receiver are included.

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Indispensable for tuning up beam antennae. Also can be used as foundation for 50,000 ohm per volt multimeter.
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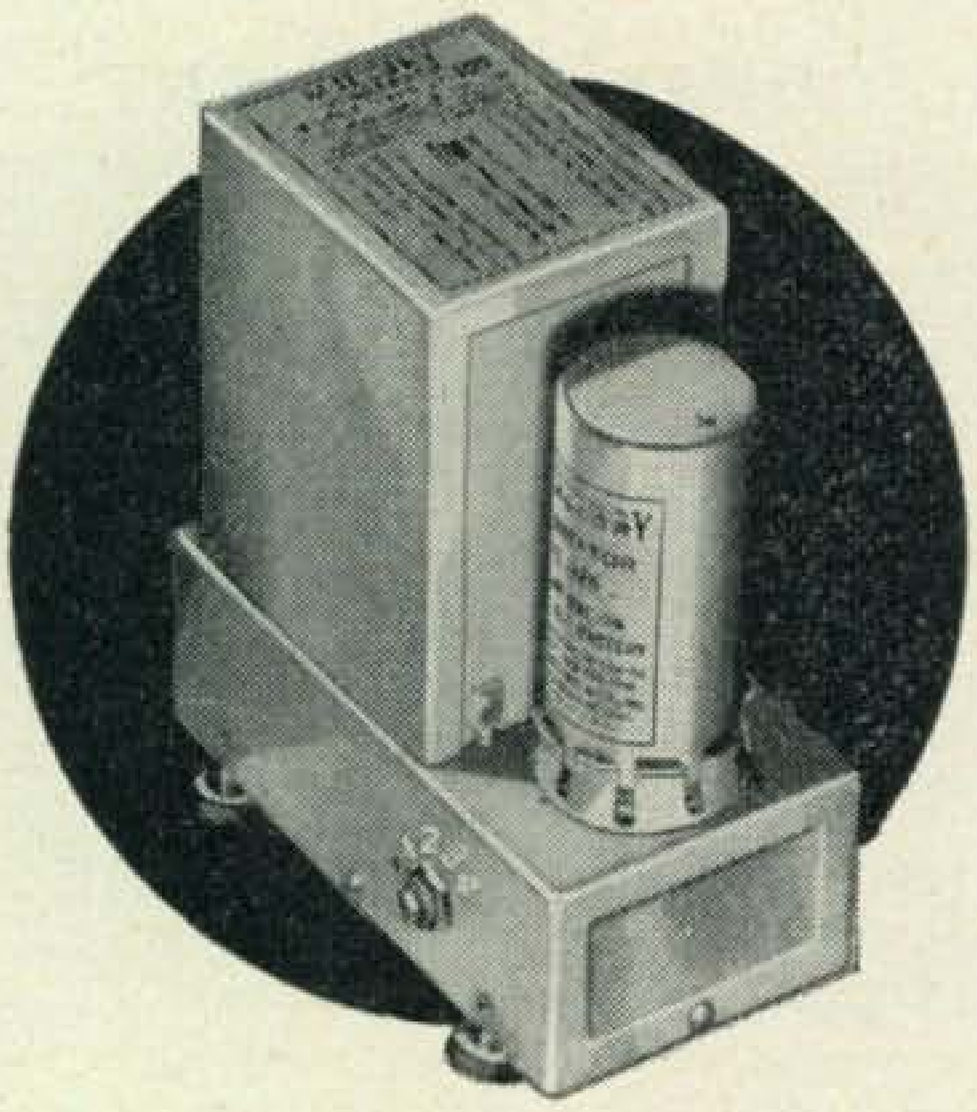

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Vibrapacks—the famous Mallory vibrator power supplies—are better than ever. Hermetically-sealed Mallory Vibrators are now standard equipment with cataloged Vibrapacks.

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When you need high voltage from a low voltage DC source for powering mobile, aircraft or portable electronic equipment, specify Vibrapack. Features include nominal input voltages of 6, 12 and 32 . . . nominal output voltages from 125 to 400 . . . models available with switch for four output voltages in approximate 25-volt steps . . . heavy-duty models with 60 watt capacity. Ask your Mallory distributor for descriptive literature, or write us direct.

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chronizing circuits. A discussion of cathode-ray tubes appears in the middle of the book, which terminates with chapters on color television and FM. Several very practical chapters are included on servicing of television receivers.

Two-Way Radio by Samuel Freedman, published by Ziff-Davis Publishing Company, 185 North Wabash Avenue, Chicago 1, Ill., 506 pages, cloth binding, $5.00.

This book's avowed purpose is to describe the mechanics and applications of two-way radio for all forms of fixed, mobile and portable communications. It can be said that it succeeds in achieving this purpose.

Commander's Freedman's philosophy is that "it is technically, financially, and legally possible for everyone to enjoy the advantages of two-way radio communication." His twenty chapters constitute a good case for his position. Half the book is concerned with planning and details of equipment. The latter half discusses the numerous fields of application for two-way radio, such as railroads, police, fire, forestry service, highway, public transportation, marine and aeronautical applications, and personalized use. The book is liberally illustrated.

A latter chapter discusses general sources of trouble and trouble-shooting. Another useful chapter points out applications requiring licenses, as well as those which do not.

The book ends with descriptions of typical installations used in various eastern localities such as Chatham, Mass., South Portland, Maine, the Cape Cod area, the states of Maine, Connecticut, and Michigan. The Border Patrol's two-way radio system is also described and illustrated.

Two-Way Radio is a book for planners and executives, rather than engineers. It is a non-mathematical semi-technical treatment. As an overall picture of communications this book is interesting reading for the ham.

Transmission Lines, Antennas, and Wave Guides, by Ronold King, Harry Minno, and Alexander Wing, published by McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, 345 pages, cloth binding.

Developed on an engineering and mathematical level, this is a good book for the practicing engineer. Various topics which have been heretofore sketchily treated receive extensive attention; the circle diagram is particularly well discussed.

Familiarity with the differential equations of trransmission lines and their solutions is assumed by the authors at the outset. The bulk of the text is on the graduate level.

Chapter 1, titled Nonresonant Lines, comprises the work given in a series of 15 one-hour lectures on the dissipationless line and impedance-matching devices. Supplementary material has

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also been added. Chapters 2 and 3, which deal with general line behavior, reflection, etc., attempt to present general electromagnetic phenomena without invoking higher mathematics, however, since it is repeatedly necessary to provide various mathematical conclusions, it is the opinion of the reviewer that these chapters cannot be effectively assimilated by a reader unacquainted with the elements of vector analysis.

Two chapters are devoted to impedance matching. These are well done, although it would appear that more might have been said about wide-band matching systems. While the topic has not been neglected, it is one which is becoming of increasing importance, and too much cannot be included in modern texts concerning the problem.

PARTS AND PRODUCTS

[from page 38]

ULTRA-HIGH-FREQUENCY BAKELITE-MOLDED MICA CAPACITOR

Exceptionally-low-loss operation at ultra-high-frequencies characterizes the new Aerovox Series 1690 molded-in-bakelite mica capacitor developed and now released by Aerovox Corporation, New Bedford, Mass.

The new capacitor has rounded hardware eliminating sharp edges and corners that cause corona loss; the use of fine threads for the terminal studs for maximum contact; silver plating for all conducting members to minimize skin resistance; and the body of XM or yellow low-loss bakelite. Internally, the mica stack of carefully selected mica and foil is designed for a straight-line path for the ultra-high-frequency current.

Body dimensions are 2-3/8″ wide by 2-3/16″ deep by 1-3/8″ high, and 4-¾″ overall between rounded terminal tips. Units are available in ratings up to 20,000 volts D.C. Test or 10,000 volts operating, and in capacitance values up to .001 mfd. at the highest voltage rating.

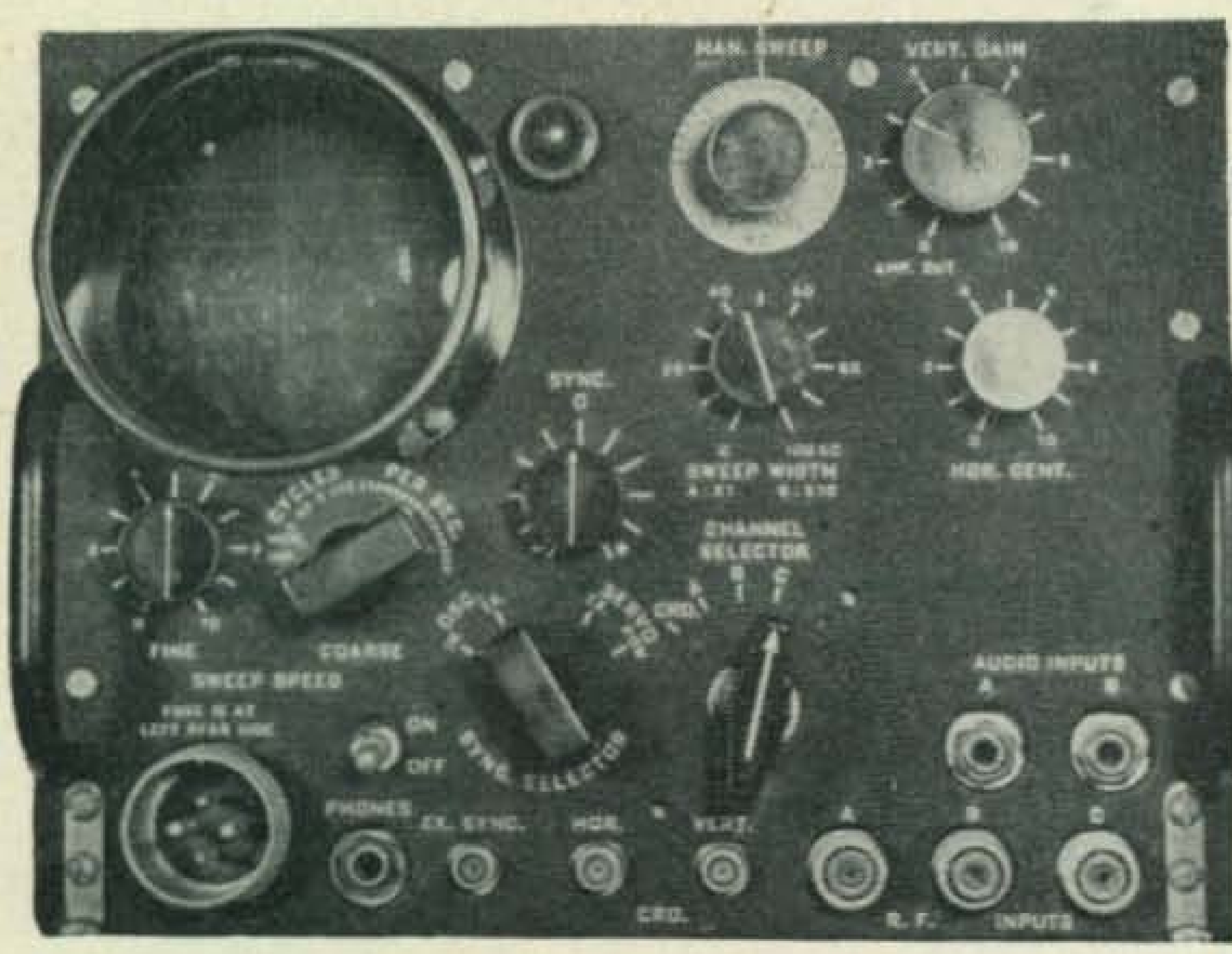
This type capacitor has been developed specifically for lower r.f. resistance and impedance, thereby providing increased KVA ratings in given bulk. Such units can be advantageously applied as blocking capacitors in transmission lines, as tank capacitors for high-frequency oscillators, as by-pass capacitors for ultra-high-frequency energy, and as coupling or by-pass capacitors in induction heating circuits.

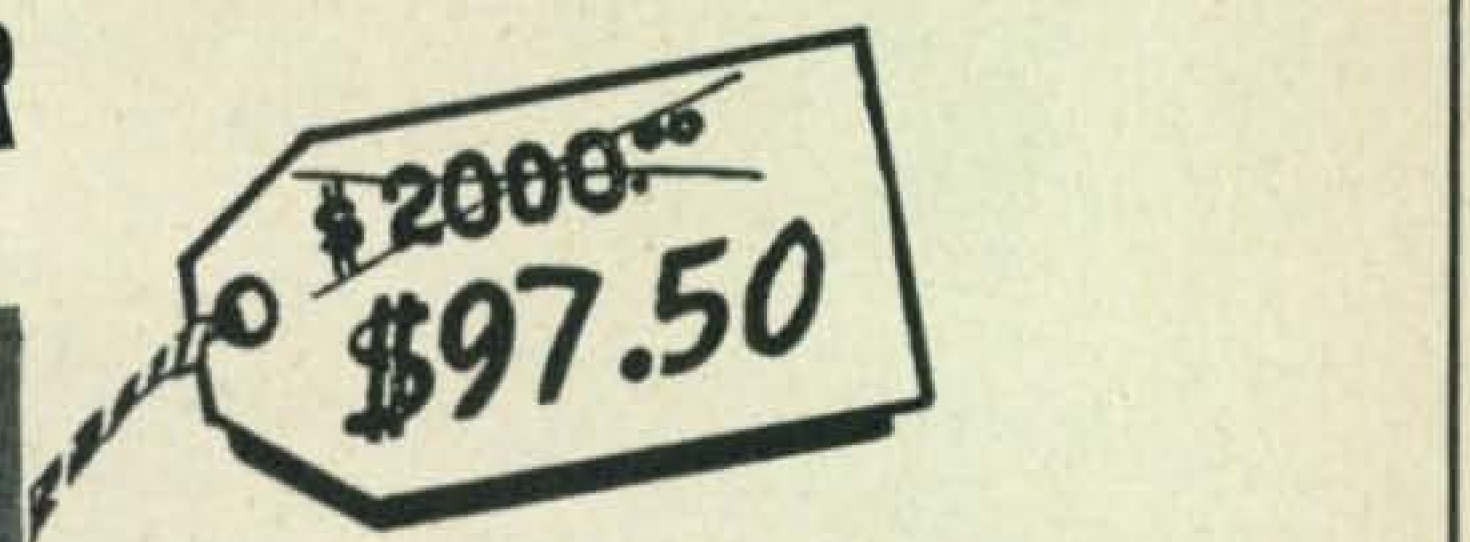
PARALLEL- RESISTANCE AND SERIES-CAPACITANCE CALCULATOR

Allied Radio Corp., Chicago, has just released

PAN-OSCILLO-RECEIVER

Performs Work of 4 Units





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(Mail 50c for 80-page Technical Manual Instruction book.)

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(*New war surplus manufactured by Templetone) a new Parallel-Resistance and Series-Capacitance Calculator. This new calculator is essentially a slide-rule device, designed to provide a rapid and accurate means of determining the reciprocal of the sum of two reciprocals as expressed by the formula $\frac{1}{x}=\frac{1}{a}+\frac{1}{b}$. A single setting of the slide automatically aligns all pairs of a and b values which will satisfy the equation for any given value of x. This calculator indicates in one setting the numerous pairs of resistances which may be connected in parallel, or capacitances in series, to provide any required resistance or capacitance value. Range: 1 ohm to 10 meg-ohms; 10 $\mu\mu$f. to 10 μf. However, the capacitance and resistance figures on the face of the rule can just as well serve to represent inductance, impedance, reactance, or other units which can be handled in a similar manner. Thus, the calculator becomes equally valuable in solving probl ms involving inductance in parallel, coupled inductance, numerical magnitude of impedance, parallel resistance, etc.

SUB-OUNCE TRANSFORMERS

United Transformer Corporation, New York 13, N. Y., announces the availability of a new series of UTC Sub-Ouncers, thus far only used in military equipment where smallest possible weight and volume were a prime consideration, as for instance in air borne devices and walkie-talkie sets. These small transformers are 9/16" x 5/8" x 7/8" and weigh only 1/3 ounce.

The coil is uniform layer-wound of Formex wire . . . on a molded nylon bobbin. Insulation is of cellulose acetate. The leads are mechanically anchored externally and therefore do not rely on outmoded tape fastening. The core material is Hipermalloy and the entire unit is triple (waterproof) sealed.

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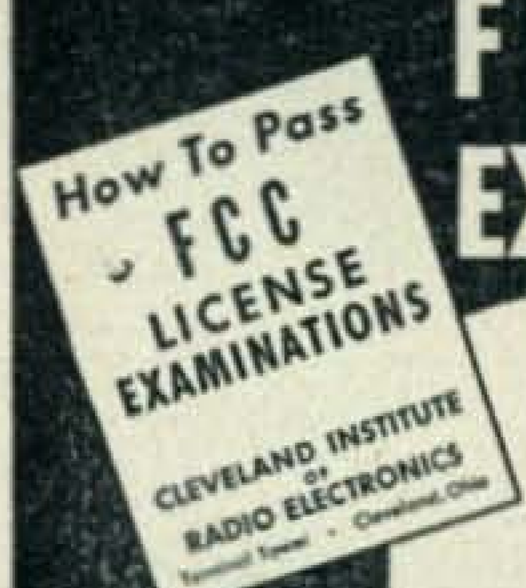

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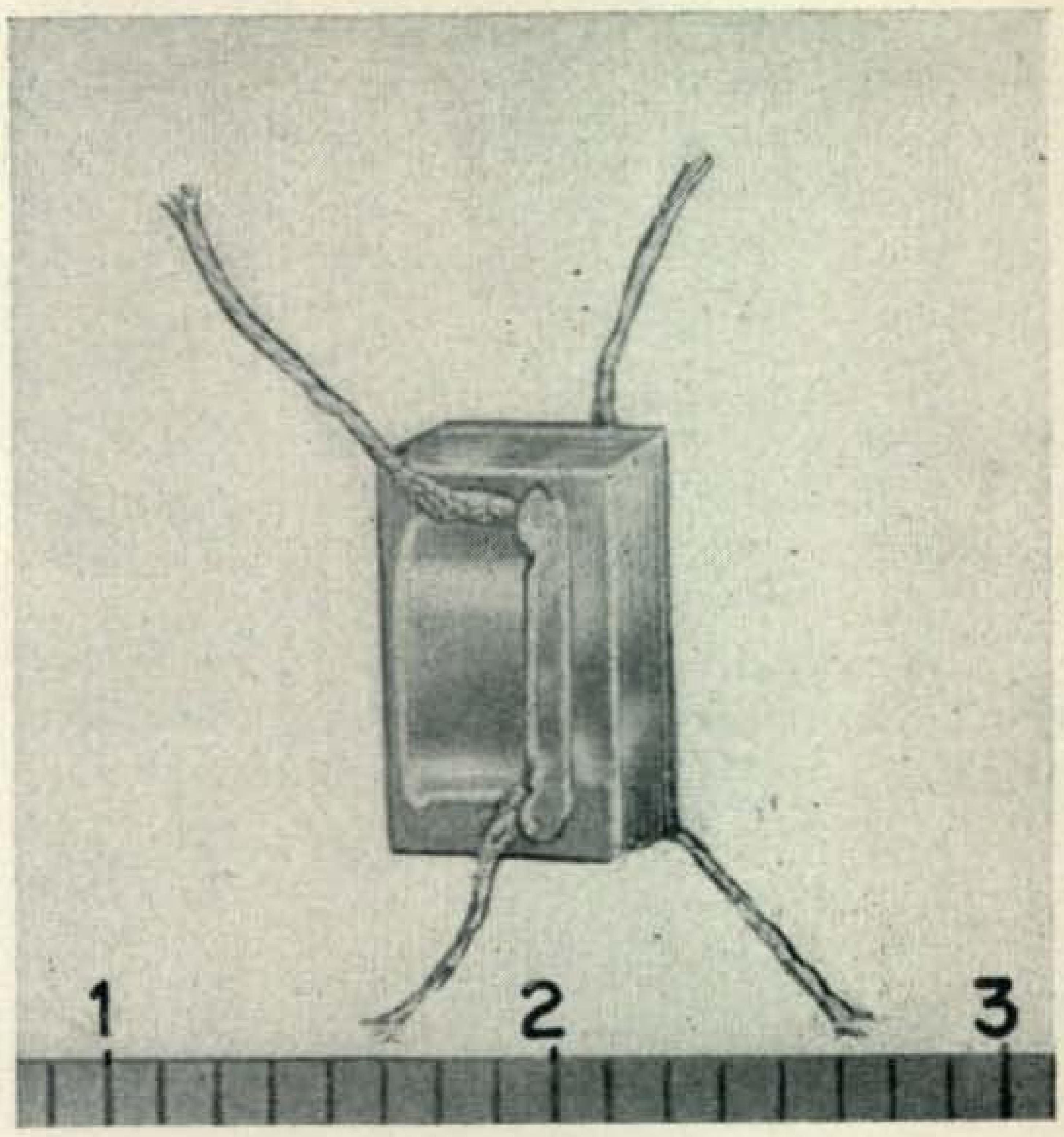

special units designed to manufacturers' requirements, five standard items are available . . . frequency response ± 3 d-b from 200 to 5000 cycles:

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		50	0	62,500
SO-2 Interstage 3:1	4 vu	10,000	0	90,000
SO-3 Plate to Line	23 vu	10,000		200
		25,000	3/1.5 ma	500
SO-4 Output	20 vu	30,000	1.0 ma	50

SO-5 Reactor 50 HY at 1 ma d-c
3000 ohms d-c res.

[Because of the shortage of space in this issue the new FCC Rules for Amateurs will start in the June issue.]

CQ DX

[from page 35]

W8BTI is on " in a small way." He has a four element beam, and 400 watts to his *exciter*. The combination accounted for 31 countries in three weeks. W8FGX's half KW has worked 36 countries. W8JJW, 200 watts, and W8CLM, 700 watts, have 20 countries. W8BPU's 400 watts equals 38 countries, while W8SDD's 42 countries leads the Cincinnati gang so far. W8BTI is now four miles from his old location, which was such a wonderful location for Asians. He doesn't know yet how good the new location is; although he has worked a few Asians. (The line will form on the right for those trying to rent the old place.)

W1IOZ tells a story that makes it sound like all the W1's are still off the air. Being that that is true, I just *think* I hear the Europeans working W1's. Here is the sad story: W1IOZ runs an amateur and commercial supply shop, but he doesn't yet have a receiver for himself. However, he still expects to beat W1AVK on the air. W1EVZ works DX even while taking a bath. The XYL, W1GQT, acts as his remote control system. W1FAU's 810's are sure death on DX, but the BCL's won't let him use them. W1CND and W1GKY can't get power into their beams. W1AVK has PP 4-250's, modulated by PP 100TH's and a three element beam, 65 feet high—but it isn't finished.

The most controversial question among DX men is whether we should start over in counting countries, or continue where we left off before the war. A few of their comments follow: W5KC: "I am in favor of a grand total instead of countries worked since the war, as I know what a time I had trying to get a QSL card from some of the rare ones."

W8BTI: "The gang around here were pretty much against starting all over on totals. Makes it too hard to get cards from nearby popular countries for no useful purpose. It is claimed that it is fairer for all, but what is fair to throw all the years of efforts away so that new hams can feel they are DX'ers, hi?"

W8LEC: "I believe most hams would prefer to stress their post-war totals; although many of the old gang are already complaining about "lost" DX records. My personal view is to stress post-war records. A person works harder when the going is tough, and, anyway, experience counts for a lot in this game, and is showing up already in the DX records of old timers." What do you think?

W9PK says that VP3LF's address is correct in 1939 call books. (It isn't in 1938 or 1940 issues—I looked.) PK clarifies his remarks about antennas: "Please don't quote me as saying a phased array is better than a rhombic. The rhombic has many minor lobes that make it a splendid all around antenna if properly oriented. It apparently works as well or better unterminated, but then it has lousy discrimination on receiving. With the Sterba the minor lobes are not present, yet the signals (on the beam) are just as strong, and it has terrific discrimination to signals off to the side of the beam. . . However, it is still my contention that the rotary beam is the logical antenna for high frequency operation."

The above contribution surely ought to put the W9's on the map it would seem to me. Now to W6HOG who reports working W2JUA operating portable in Osaka. W2JUA is running 35 watts, the antenna is Lazy "H," frequency 28400. This is on phone. W5HHO also on phone operating in Tokyo.

I would like to thank the SWL living in Capetown, South Africa, for sending in a couple of newspaper clippings giving a little information on the probable future ham activity. For example, it says in one clipping that for the time being

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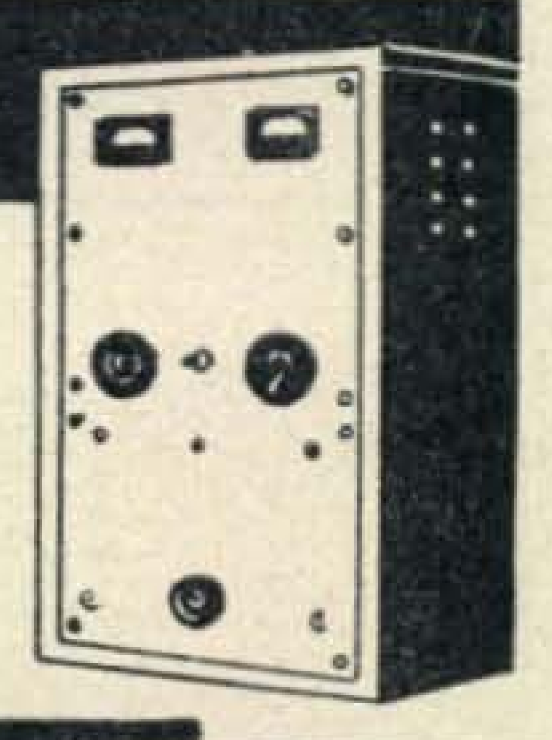

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only the pre-war hams are to be allowed back on the air due to a shortage of "wavelengths" (maybe the O.P.A. should have a special division for wavelength shortages). Anyway, to go on with this newspaper clipping it seems that there were about 500 hams in the Union before the war and now they expect double this number at least. In the second clipping the contents were put out by the Postmaster General and covered, among other things, the maximum power allowed to the final amplifier,—on the 58 mc band 25 watts input and on the 28 mc band 100 watts input.

The above makes me think a little bit about low power and, speaking of low power, there is a guy in Los Angeles, W6FMO, who seems to have specialized in flea power for years. Many of you fellows have no doubt worked FMO but I wonder how many of you really know what he is running. Here's the dope: His final amplifier consists of a 25C6 with roughly TWO watts input. Actually, he's running about 90 volts on the plates at 27 ma. He modulates this tremendous power and has worked a lot of stuff in the Pacific, including VKs and ZLs. He is using a 3-element rotary beam which obviously must be efficient, otherwise this two watts wouldn't get out of his back yard. The other day he said, "Herb, I think I'll raise power ——to 4 watts."

In scanning over G2MI's column in the RSGB bulletin, I think there are a number of things you fellows would like to know. For example, we see that LA6A says that 130 Norwegian amateurs have been re-licensed and for the whole 28-30 mc band. These applicants had to produce a detailed account of their activities during the Nazi occupation. In Switzerland HB9T says the Swiss bands are as follows: 3500-3635, 3685-3950, 7-7.2, 14-14.4, 28-30, 58.5-60, 112-120, and 224-230. Calls are in the series HB9A-Z, 9AA-DZ, 9FA-F. All others are pirates. In France it looks as though all pre-war hams are being relicensed for the following bands—28-30 and 58.5-60. Power, 100 watts. Going further into G2MI's column he says that G6CU, operating on Cocos Island, has had a supply of QSL cards sent to him. Incidentally, any of you fellows who want to send G6CU a card please send it as follows: F/Sgt. Evans, 5 St. Lukes Road, Maidenhead Berks, England. This, of course, is his home address. I get a bang out of one little remark relative to G6CU. "Please keep your perishin' ECO'S off of him." It seems that W2KMZ/ELis operating in Liberia. No frequency is listed. W6ENV, W6EXQ, W6ADP, W6ITA, W9ANS/6, W6LEE, W6SA, W6AM, W6ANN, are still doing their share of c.w. DX in the Los Angeles Area.

Up around the San Francisco bay area reports are somewhat meager but from what I can see W6CEO, CHE, XV, WN, RBQ, SC, and RRR seem to be knocking them off very well. As a matter of fact, W6RRR (sometimes he stutters and hangs on an extra "R") worked W4YA in Burma. From what I hear RRR actually worked him by mistake, thinking possibly he was just another W4.

If you hear KF6SJJ, better listen a second time because he's operating for the time being portable in W1. He is not on Howland Island. You may recall that Bob used to be W1KFV before his pre-war stay on Howland. Some of you fellows have probably worked W6NSL/J. If so, he was in Tokyo Bay, off Yokohama and running 30 watts on 28040 c.w. His ship was the "SS Peter Lassen." If you want to get in touch with him, the best way would be to address him as follows: Victor S. Bettencourt, 858-55th St., Sacramento, California. In a letter from W2ISQ, who for the time being is with the Armed Forces Radio Service in Los Angeles, he said he would like to start WAZ from scratch and feels that in giving credit for total pre-war countries might be somewhat erroneous due to many national boundaries being changed. He says as long as *"CQ"* is a new magazine why not start WAZ with a clean slate. He likewise suggests, and possibly with some merit, too, that the number of zones be increased to 50 or 60. Before too long we'll spring loose with some more information on the Zone situation.

If you have held up after reading this bunch of chatter, you've done pretty well. I'll have to admit the continuity is not what it should be but, as time goes on and you fellows send in your contributions, we'll try and put the stuff together in more of a systematic manner. I wonder if you would like to revert to the pre-war procedure of taking the rare DX calls with their frequencies and listing them in columns. We did this in the old DX column because many fellows liked to refer to a list rather than have to hunt through a whole batch of gossip to pull out one or two DX stations and their frequencies. If we go for this idea again, we will, of course, eliminate the frequency listing in the various paragraphs throughout the column. Let's see what you have to say on this. As you may or may not have noticed, we have eliminated most of the run of the mill DX, such as VKs and Gs. I would like to stress that when you send in any DX notes to please put the frequency or approximate frequency on the rare stuff. I'd like to get you fellows to hop on some of these foreign stations and have them send me some DX news and let's get some photographs in from these fellows also. We'd like to cook up a good photo section showing the DX stations scattered all over the world. We'd especially like to see the stations operated by our Service men in the various occupied countries.

Here's a thought. In order to save a few days

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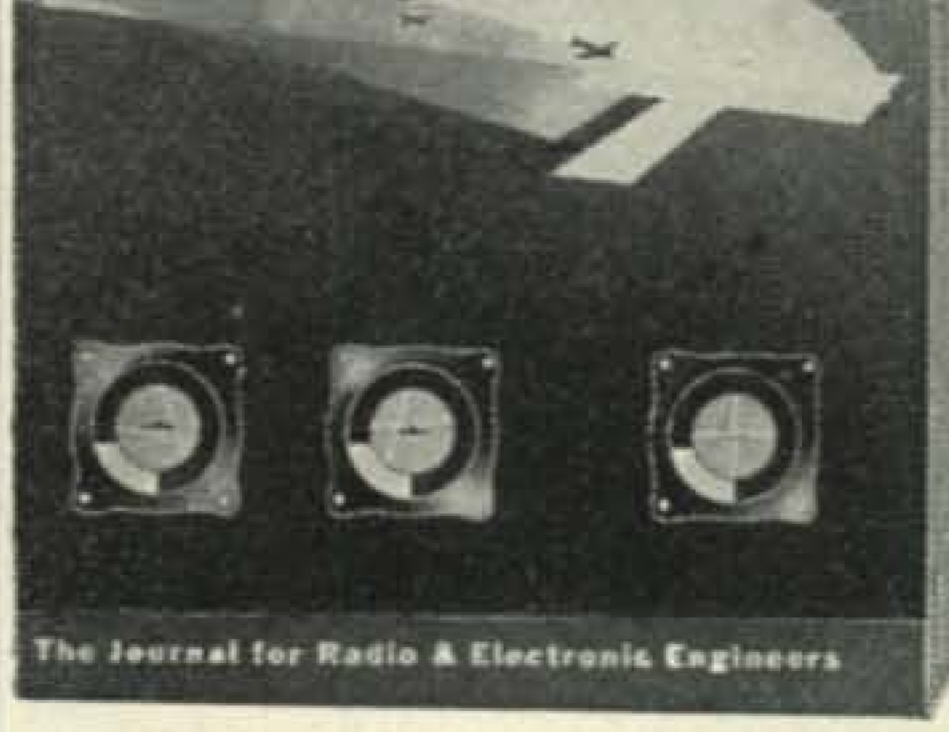

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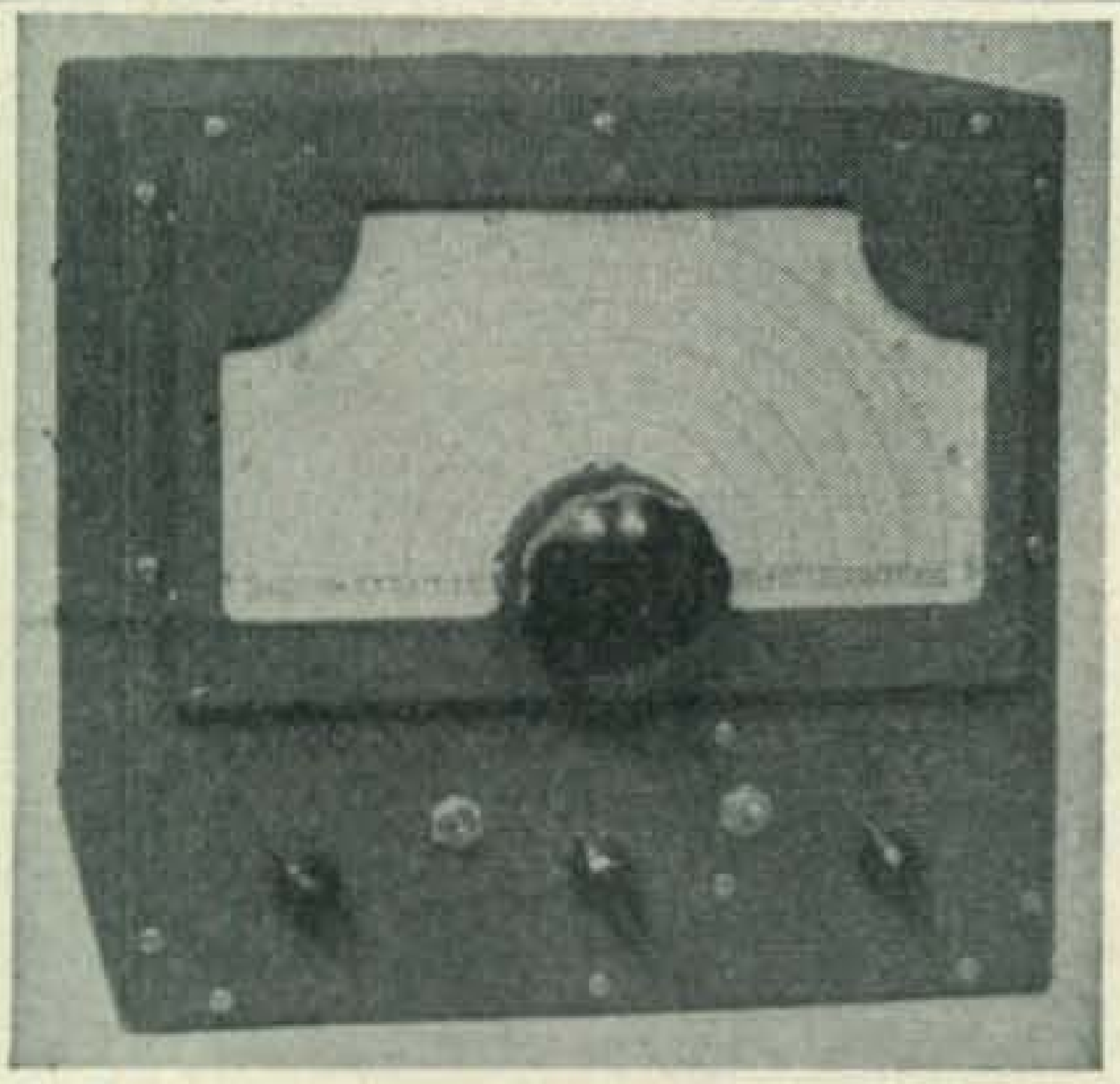

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shoot all your DX news in to me at the address listed at the head of this column.

In signing off for this month, I hope you've seen at least some improvement over the previous month but I well realize there are a heck of a lot of you fellows not listed who are working just as good, if not better, DX than any of those mentioned. There are a lot of the DX boys who are ultra modest and feel like they are seeking publicity if they send in a contribution. From these fellows we seldom get anything and, what we do get, is gained through the efforts of our old "operative #1492." Then there are the fellows who go overboard and send you reams and reams of information but for obvious reasons all of it cannot be printed. To these fellows I would like to say the letters are interesting, keep it up, and don't feel hurt if all the contents do not appear in print.

Then, in addition to the above, there are the fellows who really like to pat themselves on the back and do a good job of bragging. Well, as I see it, it's a lot of fun and to the modest DX man I wish he wouldn't feel like it's a case of publicity. This DX department is going to be conducted much the same as I handled it for 6 years in "Radio." It is going to be a column devoted to the DX man, not only for putting in print what he has worked, but more important to show this DX information for the other guy to use also. When we boil down all these contributions, we try to put them all on about the same level. We want to conduct a good informative as well as interesting department devoted to the DX man. Naturally, your suggestions are going to help in carrying this thing along.

There are a number of districts not very well represented in this month's column, especially from the Down East area, more particularly Connecticut. Speaking of Connecticut brings to mind a fellow who has had good DX intentions for years. Some of you may know him. He does manage to do a job for a certain magazine, the first letter of which is *"Q,"* and month after month he will be saying, "How's DX? How's DX? How's DX?" He has to ask this question since he's never on the air to find out himself. Oh, well, he used to be a good guy, too.

Not that you're a bit interested, but W6QD is still fussing around trying to get a 3-element rotary on top of a 60 foot telephone pole. There will be a little matter of stepping the pole before we can set the rotary on top. Oh me, for the good old days of the Rhombics. The antenna system at present consists of two separate half wave dipoles with Q-matching sections. Naturally they are placed to take advantage of the most important points on the globe. For the time being this will have to do. At least I can work Chicago which they tell me is still in the 9th district.

CALLS HEARD

[*from page 32*]

(14 mc c. w.)

I3AR; I8AB; HB9EK; PY2KT; SU1KE; YV5AP; ON4X.

Paul L. Rafford Jr., W2GQM / Paris, France
March 23, 1946
(28 mc c. w.*)

W 1AXL-7; 1BST-6; 1COI-7; 1CQR-6; 1CGY-7; 1DBE-8; 1DKS-7; 1ECX-7; 1EKU-7; 1FH-8; 1FNL-8; 1HUJ-7; 1HJB-8; 1IWU-7; 1KGE-7; 1KPN-6; 1KRE(c.w.)-7; 1LOS-7; 1MCW-7; 1MEV-7; 1NAO-6; 2ATF-7; 2BKU-7; 2BYM-6; 2BYV-7; 2BFB-7; 2CWK-6; 2COT-7; 2CDN-7; 2EIE-7; 2FIA-7; 2GWV-7; 2GZS-8; 2JQF-7; 2JXH-6; 2JZS-7; 2JMA-7; 2LIR-8; 2LQD-7; 2MJC-7; 2MPA-8; 2MHH-7; 2MFS-7; 2NLY-7; 2NRR-7; 2OCL-7; 2QF-8; 8DSU/2-7; 8LO/2-8; 3AXU-7; 3CBT-8; 3CFP-7; 3DNN-7; 3FII-7; 3GRO-7; 3HN-7; 3HMK-7; 3HQG(c.w.)-7; 3JAK/mobile marine-7; 9ZUK/3-8; 8AFQ-8; 8BQJ-7; 8LSR-6; 8NYP-6; 8QWE-6; 8QL-7; 8WAL-6.

*"It would be impossible to record all the signals heard because the band sounded exactly like the 75 meter phone band on a Saturday afternoon before the war. Heterodynes, QRM, loud signals and weak ones all came through. Heard anybody who had anything on the air. The above signals were logged between 9:00 and 10:00 a.m. EST and 11:00 a.m. to 1:00 p.m. The receiving location is very poor. An RCA AR-88 receiver with 10 foot verticle indoor antenna was used and the very busy Champs Elysees Boulevard provided continuous auto QRN despite the gas shortage in France. Signals below an S6 were not recorded although many of them were 100% readable. We had to draw the line somewhere. We couldn't honestly say that anybody was S9, although W8AFQ with his 500 watts and 4 element beam deserved it if anybody did. On the following day not a peep could be heard on the entire band!"

SELSYNS

[*from page 31*]

will snap into its zero position. Setting the selsyns on electrical zero before placing into operation and coupling them to the beam in its zero position (North or any arbitrary position desired) will facilitate lining up the system and locating any errors.

When buying used selsyns, they should be checked over carefully. Make sure the bearings are in good condition. A bad bearing may cause errors and erratic operation. Check to be sure

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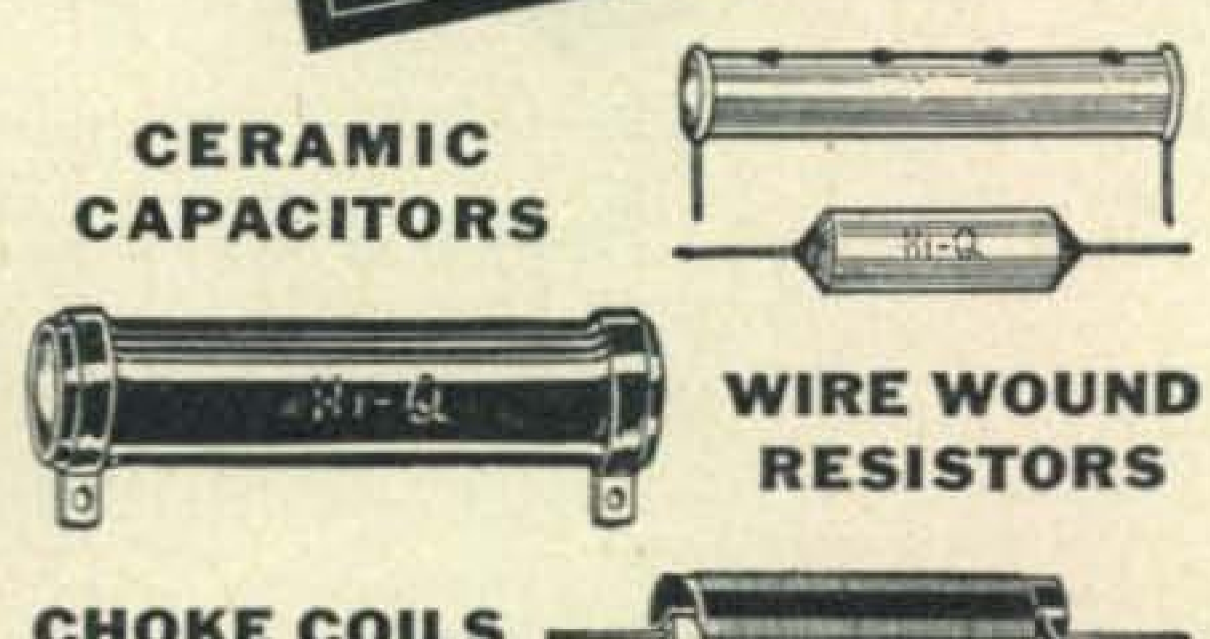

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the shaft runs true. An ohmmeter will tell you if any of the coils are opened or shorted. Take a good sniff and see if you can detect any burned odors—selsyns can definitely burn out. Last but not least, make sure of the voltage and frequency of the current your selsyn is designed to operate on. (Incidently 400 cycle selsyns will work on 60 cycles if the voltage is dropped.)

CATHODE MODULATOR

[*from page 17*]

The 6L6 push-pull amplifier is driven in Class AB, by a 6N7 dual triode phase inverter. The amplifier grid connects to a gain control and for full output a volt or two of a-f is needed. A 6SJ7 or 6SF5 high gain stage with a crystal microphone will function satisfactorily for "close talking" operation.

A 6C5, 6J5, or 6N7 (parallel connected) may be used as a cathode-driven amplifier with a carbon microphone. This new circuit eliminates a mike transformer and it also supplies d-c current to the carbon mike. The gain is about 10 with a 6J5 and nearly 20 with a higher gain tube such as a 6N7 when driven by an average telephone or handmike of the single button variety. The grid is grounded and the resistance of the mike in the cathode circuit produces grid bias to maintain the plate current at from 5 to 10 ma. The cathode impedance is low, so relatively high gain at excellent voice quality results. A 200 ohm, ½ watt resistor was connected into the mike jack circuit to maintain some plate current with the mike disconnected. It is shorted out when the mike is in use. The 6J5 plate resistor must be capable of handling up to 10 ma of plate current, indicating the need of a 2 watt resistor.

This method of obtaining mike d-c current requires fewer parts than any other scheme that the author has seen or devised. An octal socket can be easily wired up so as to use either a 6J5 or a 6N7 (parallel), interchangeably.

The complete modulator was built into a 4" x 3" x 17" chassis with the tubes and other parts protruding on the rear 3" x 17" side. This permits the use of a standard 3½" x 19" relay rack panel for rack or cabinet mounting in any transmitter.

The taps on the 10,000 ohm resistor in the output circuit should be adjusted to produce a good modulation picture on a scope. These taps can be adjusted to permit the use of this modulator with any class C r-f stage, single or push-pull, with inputs of from 50 watts up to 300 or more.

The r-f amplifier filaments should have an r-f by-pass condenser from each side to ground at the socket terminals. These condensers should be rated at 500 volts or more to prevent breakdown from the audio voltage. These by-pass condensers can be made as large as .01 μf each in order to attenuate frequencies above 2500 cps for voice communication. This modulator is connected so as to be in series with the final amplifier cathode or C.T. lead to ground and –H.V. The r-f amplifier grid return lead from the r-f choke connects to the resistor shown in the circuit. The –C bias may be the normal grid leak or fixed C bias supply in the transmitter of the valve suitable for c.w. operation. The –C bias return or positive lead then connects to ground and –H.V. The arrangement shown was set up so as to simplify connection into the c.w. transmitter. It only requires opening up the CT and grid bias leads to the final amplifier. Other output circuit arrangements shown in radio handbooks may be substituted if desired.

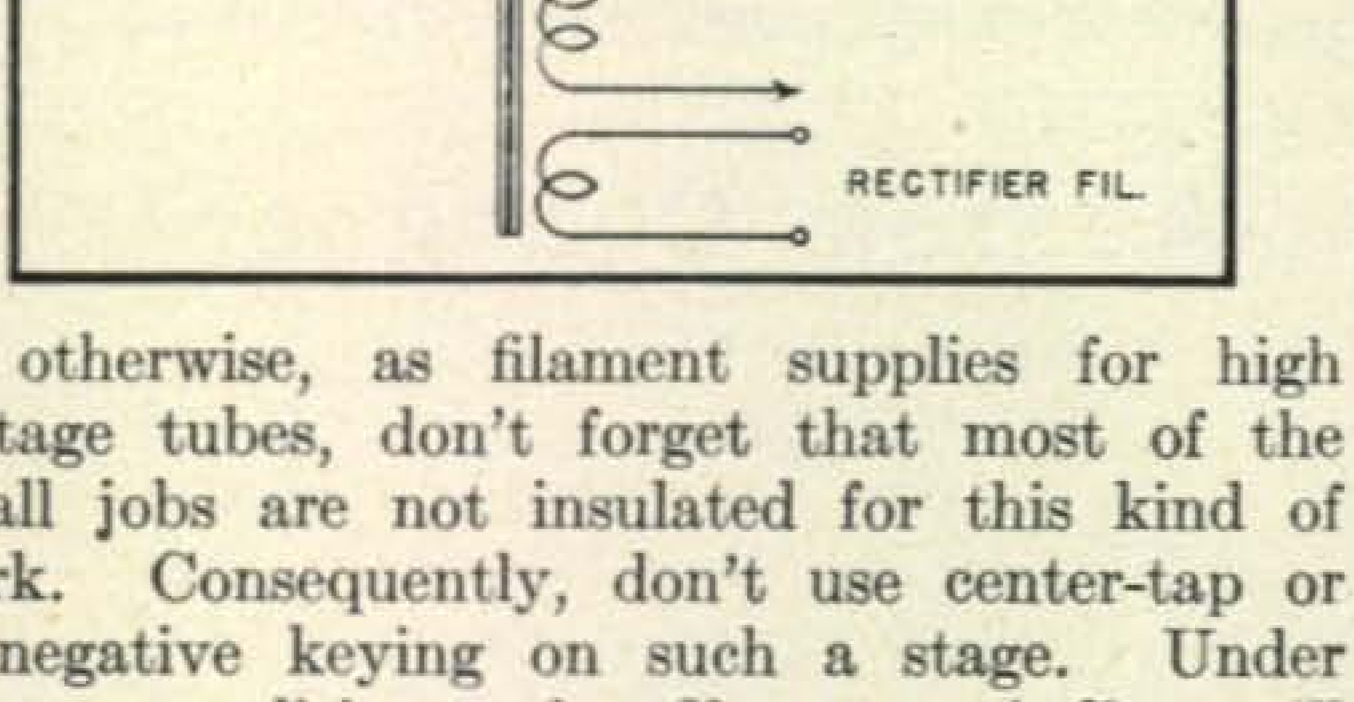
FILAMENT TRANSFORMERS

[*from page 26*]

(series aiding) will put practically 9 volts across the test lamp.

In most applications, it will be satisfactory to ground one side of the 6.3 volt pair, rather than add an external center-tapped resistor. The maximum current that can be drawn is, of course, the rating of the lowest current winding (almost invariably the 7.5 volt secondary).

(Editor's Note: If material shortages are forcing you temporarily to use small transformers with secondaries in series, parallel,



or otherwise, as filament supplies for high voltage tubes, don't forget that most of the small jobs are not insulated for this kind of work. Consequently, don't use center-tap or B negative keying on such a stage. Under key-up conditions, the filament winding will be at practically the same potential as the plate, leading to a possible breakdown secondary and core, or between secondary and primary. Similarly if using cathode modulation, make certain with an ohm-meter that the secondary of the modulation transformer is ok before applying the high voltage.)

HAM FEST!

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.25 Mfd 600 vdc can Solar.............. .60
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.85 Mfd 600 vdc rd can Aero 55850 1½x1¾.. .30
.5.5 Mfd 400 vdc th rect can.............. .60
4. Mfd 600 vdc C-D Oil.............. 1.75
8. Mfd 600 vdc C-D Oil.............. 2.88
15x15x15-450 V. Dry.............. 1.25
.05 Mfd 1000 vdc inv. mtg G. E. pyr........ 1¼x1¼x¾.............. .70
.25 mfd 1000 vdc inv. mtg G. E. pyr.......... 1½x1½x¾.............. .80
.4 Mfd 1500 vdc WE Oil.............. .50
.1.1 Mfd 7000 vdc GE pyr.............. 7.50
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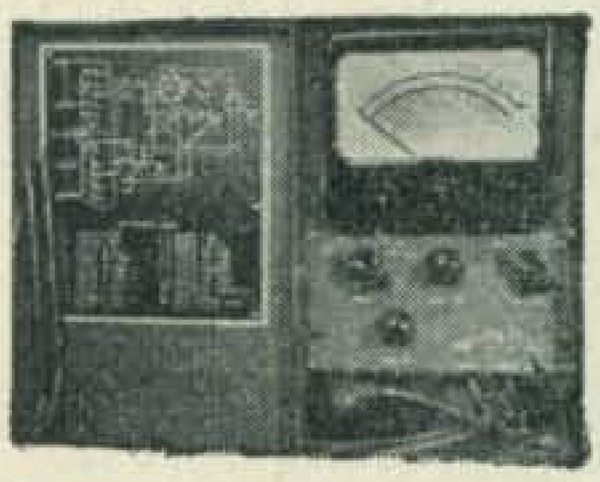

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2 BAND ANTENNA

[*from page 28*]

this a bit further, but had no chance to do this before the close-down. We had also intended to broad-band the affair for 80 meter work by adding another parallel flat-top resonating around 4.0 mc;[2] the effect of this extra radiator should be negligible on the 7.0 mc band.

The required changes in feeder connections were made automatically when changing coils; to accomplish this, one more banana plug was

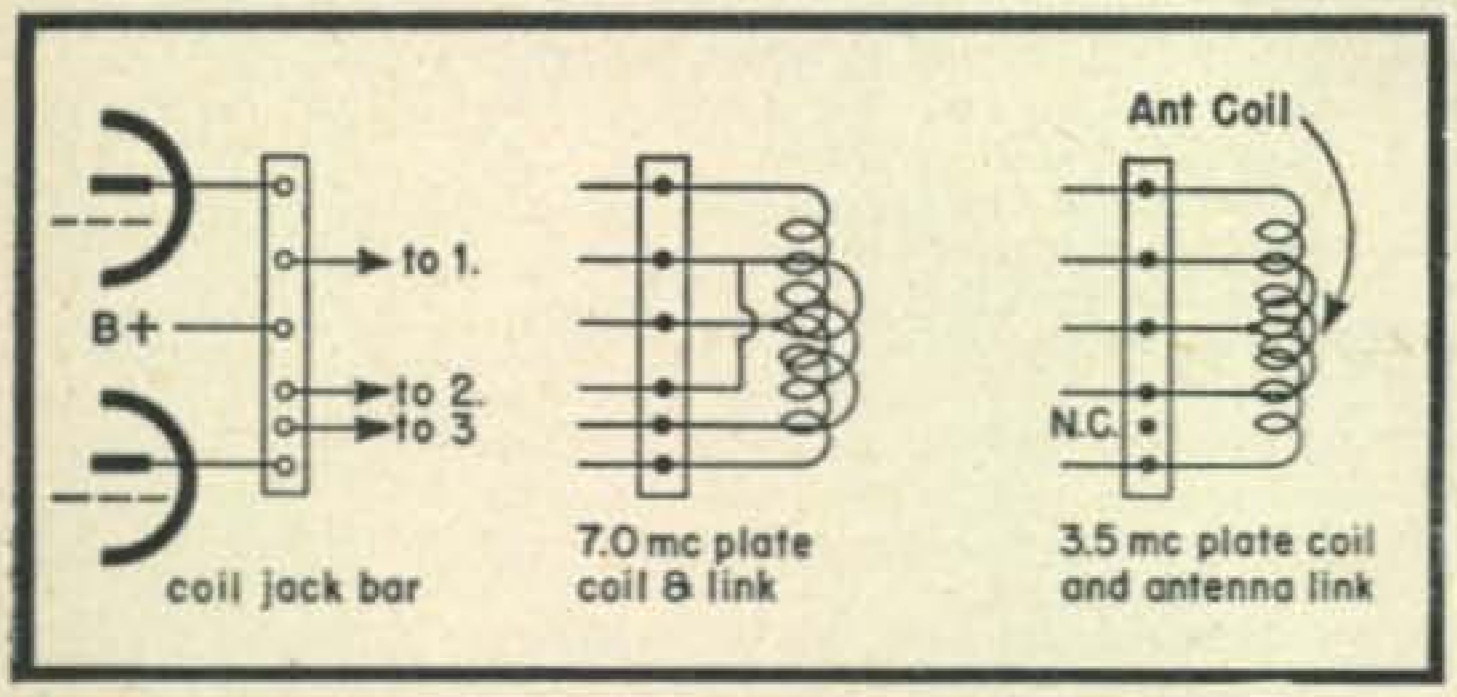

Fig. 3. Details of coil connections for two band antenna. Minor modification of transmitter tank coils is necessary. One more banana plug is used on the coil and jack bar

added to each tank coil base, and one more socket added to the coil jack bar. Details are shown in *Fig. 3*.

The antenna performed remarkably well! On 3.5 mc, it worked as a normal doublet—the extra feeder had no effect. On 7 mc, we had no difficulty in working any particular section of the country, also receiving good reports from K6 and K7. During the Sweepstakes, the XYL (W2OLB) also used it briefly on 14 mc, both with tuned feeders and, by tying all three feeder terminals together, as a "T". No real DX was heard, but three K6's were worked on the last Sunday afternoon of the contest, and reported signals as good as those from any other stations on the East Coast at the time. Stations outside the district noticed no difference between the two methods of feed, but W2's reported the "T" several S points better, probably due to the radiating 33½′ section, which represented a half-wave on this band.

[1] The explanation for this is that the feed line acts as an impedance transformer. The antenna impedance is resistive and relatively high in the case of end-feed on the fundamental and second harmonic, and similar for the center-fed wire on the second harmonic; it is resistive and low in value for the center-fed half wave. The feedline presents at the transmitter end anything from a pure reactance for multiples of an eighth-wave in length to a pure resistance at quarter-wave multiples. At intermediate lengths, the feedline looks like a complex impedance, of which the reactive component must be tuned out in the antenna tuner.

[2] Black, "Broad-Band Doublet," Radio, Nov., 1939.

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