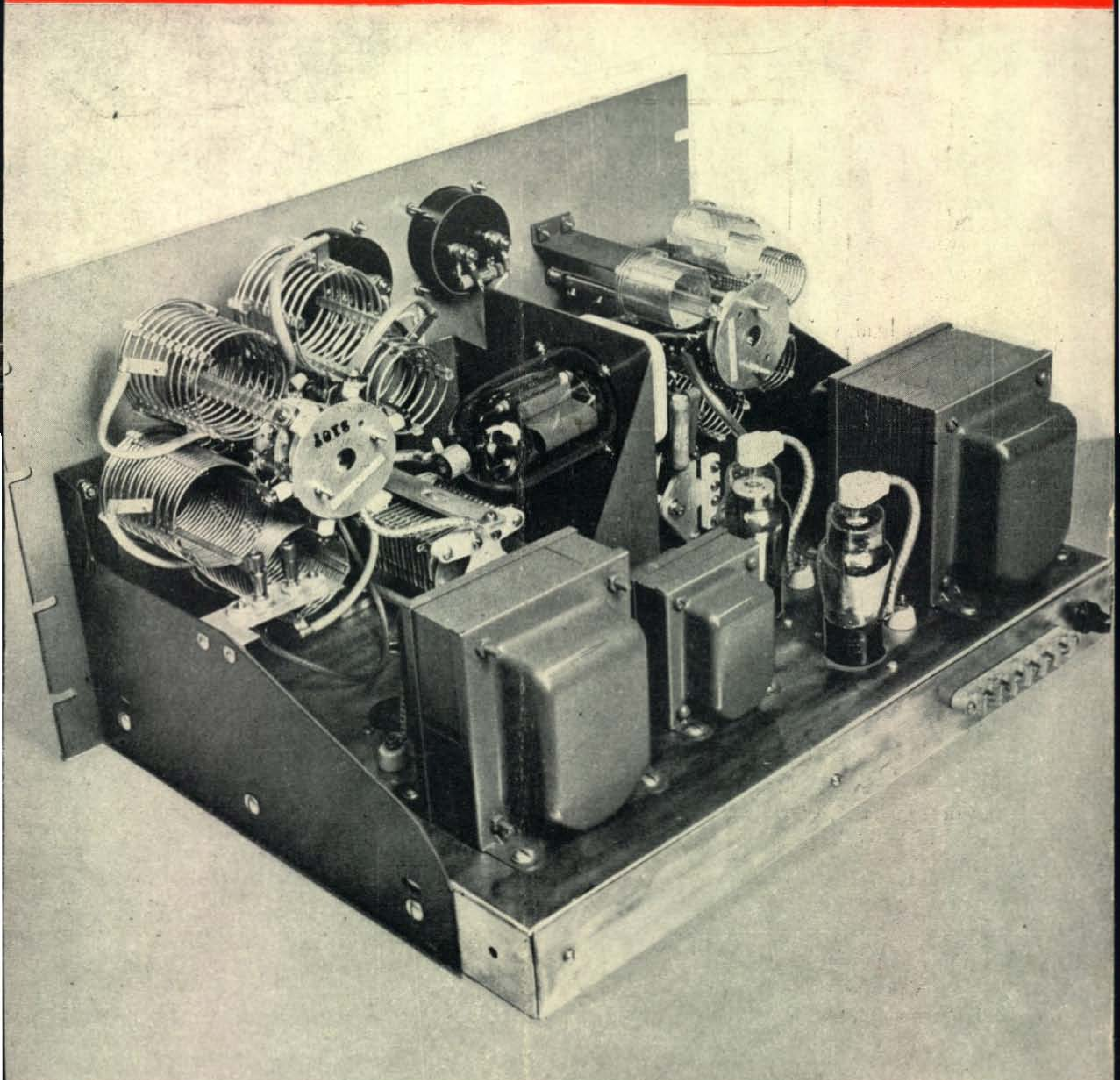
CQ

APRIL, 1947

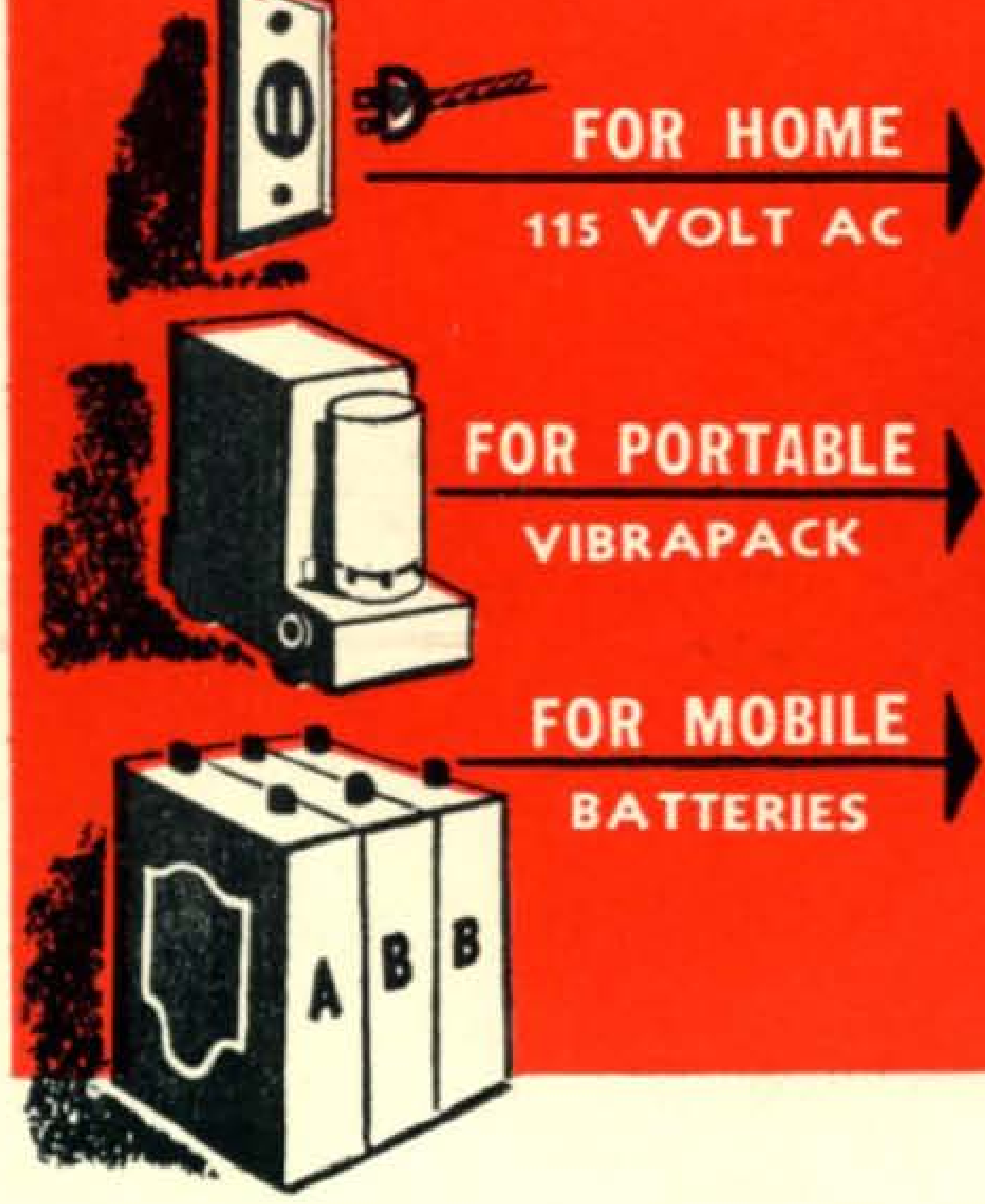
The Radio Amateurs' Journal

35¢



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

the RME 84 *excels in all three*



Being a ham, you've often wished for a portable receiver. The RME 84 was engineered with this in mind and is equipped with a special socket connection on the rear of the chassis apron making possible connections to either a B battery and an A battery supply or a similar source of power such as an external vibrapack.

Because of its modern loctal tubes, the RME 84 will operate at full power on 135 volts of B and 6 volts of A battery. Drain on the B battery is only 22 milliamperes at 135 volts and the 6 volt A battery provides 1.5 amps, including the two dial lights. Disconnecting the dial lights reduces the A battery drain to but 1.2 amps.

For those many field days, for mobile use or for home use, this modestly priced, 8-tube communications receiver is an outstanding value because of its high quality, precision construction.

Features

- Self Contained Shock Mounted 5" PM Speaker
- Four tuning ranges .54 to 44 MC
- One Preselector Stage
- Smooth Vernier Tuning Control
- Bandspread, positively geared to main tuning control for accurate logging—no backlash!
- Automatic Noise Limiter
- Beat Frequency Oscillator—continuously variable by panel control
- Headphone Jack
- Antenna Input Terminals, provision for doublet or single wire.
- Eight tube superheterodyne circuit

Write for illustrated folder.

TIME ★ WILL ★ TELL ★

RME

FINE COMMUNICATIONS EQUIPMENT

RADIO MFG. ENGINEERS, INC.

Peoria 6, Illinois U. S. A.

Going places (AGAIN)

hallicrafters

Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio equipped expedition to the Mountains of the Moon in deepest Africa—a new and exciting test for the ingenuity of hams and the performance of Hallicrafters equipment.

3 GREAT RECEIVERS designed and priced for hams who are going places, too

***Model* SX-42** Described by hams who have operated it as "the first real postwar receiver." One of the finest CW receivers yet developed. Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc, in six bands. FM-AM-CW. 15 tubes. Matching speakers available. **$275.00**

***Model* S-40A** Function, beauty, unusual radio performance and reasonable price are all combined in this fine receiver. Overall frequency range from 540 kc to 43 Mc, in four bands. Nine tubes. Built-in dynamic speaker. Many circuit refinements never before available in medium price class. **$89.50**

***Model* S-38** Overall frequency range from 540 kc to 32 Mc, in four bands. Self contained speaker. Compact and rugged, high performance at a low price. Makes an ideal standby receiver for hams. CW pitch control is adjustable from front panel. Automatic noise limiter...................... **$47.50**

Prices slightly higher in Zone 2

BUILDERS OF *Skyfone* AVIATION RADIOTELEPHONE

hallicrafters RADIO

THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

Sole Hallicrafters Representatives in Canada: Rogers Majestic Limited, Toronto-Montreal

The Radio Amateur's Journal

Published monthly at 28 Renne Ave., Pittsfield, Mass. by RADIO MAGAZINES, INC. Executive and Editorial Offices: 342 Madison Ave., New York 17, N. Y. Telephone: MUrray Hill 2-1346. Entered as Second Class Matter March 28, 1946 at the Post Office, Pittsfield, Mass.

Branch Offices: Chicago — 82 W. Washington St., Chicago 2, Ill., ANDover 1395. Los Angeles— J. C. Galloway, 816 W. 5th St., Los Angeles 13, Cal., MUtual 8335.

Subscription Rates: in U. S. A., Possessions and Canada 1 year $2.50, 2 years $4.00, 3 years $5.00. Single copies 35 cents. Elsewhere $3.50 per year. CQ (title Reg. U. S. Pat. Off.) printed in U. S. A. Copyrighted 1946 by Radio Magazines, Inc.

Foreign Subscription Representatives: Radio Society of Great Britain, New Ruskin House, Little Russell St., London, W.C.1, England; Harris & Floyd, 297 Swanston St., Melbourne C. 1, Victoria, Australia.

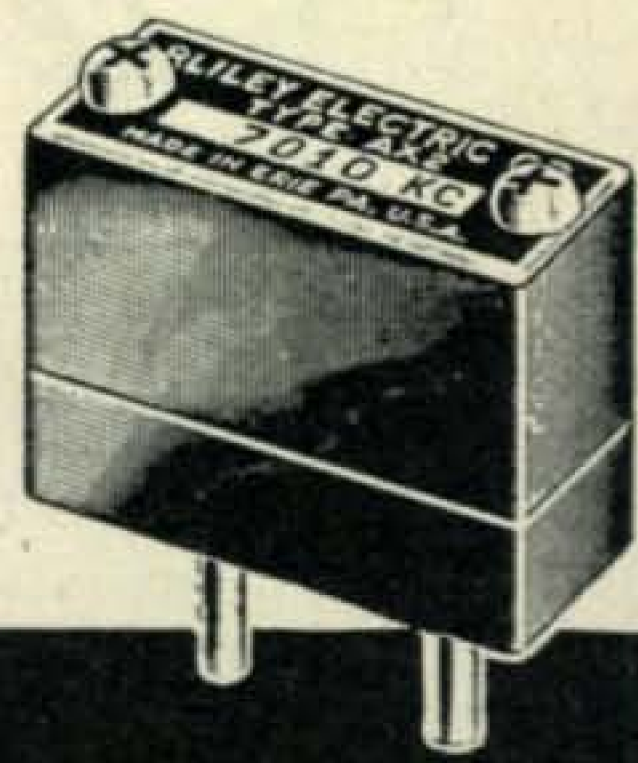
Vol. 3. APRIL, 1947 No. 4

In This Issue

COVER

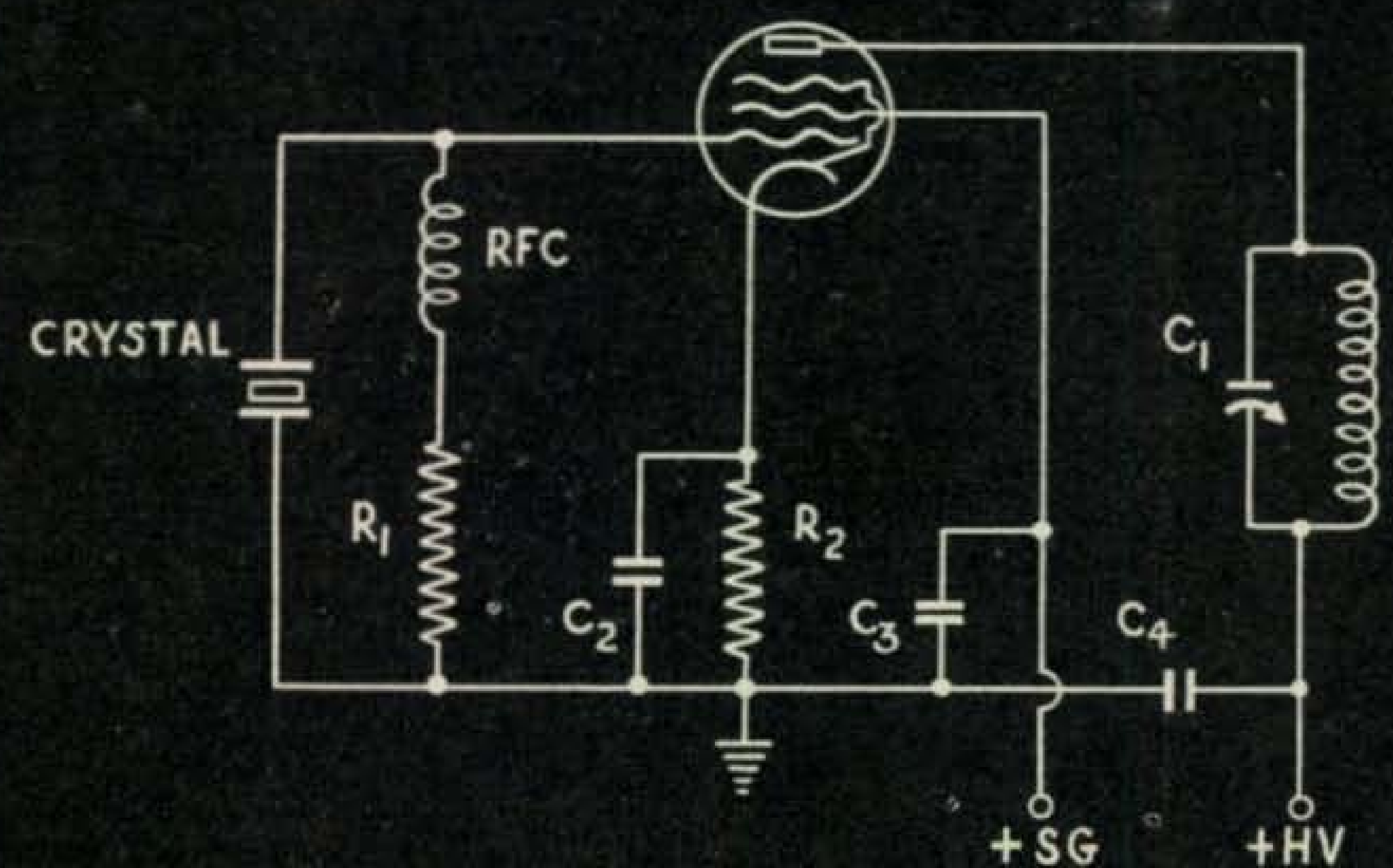
The Contest Special—designed for operation on any one of five bands. Features include bandswitching throughout, easy-to-drive RK 4D32 beam power tetrode, sufficient power to work DX, but low enough power to take advantage of contest multipliers. The full story will appear in an early issue of CQ.

BLILEY AX2

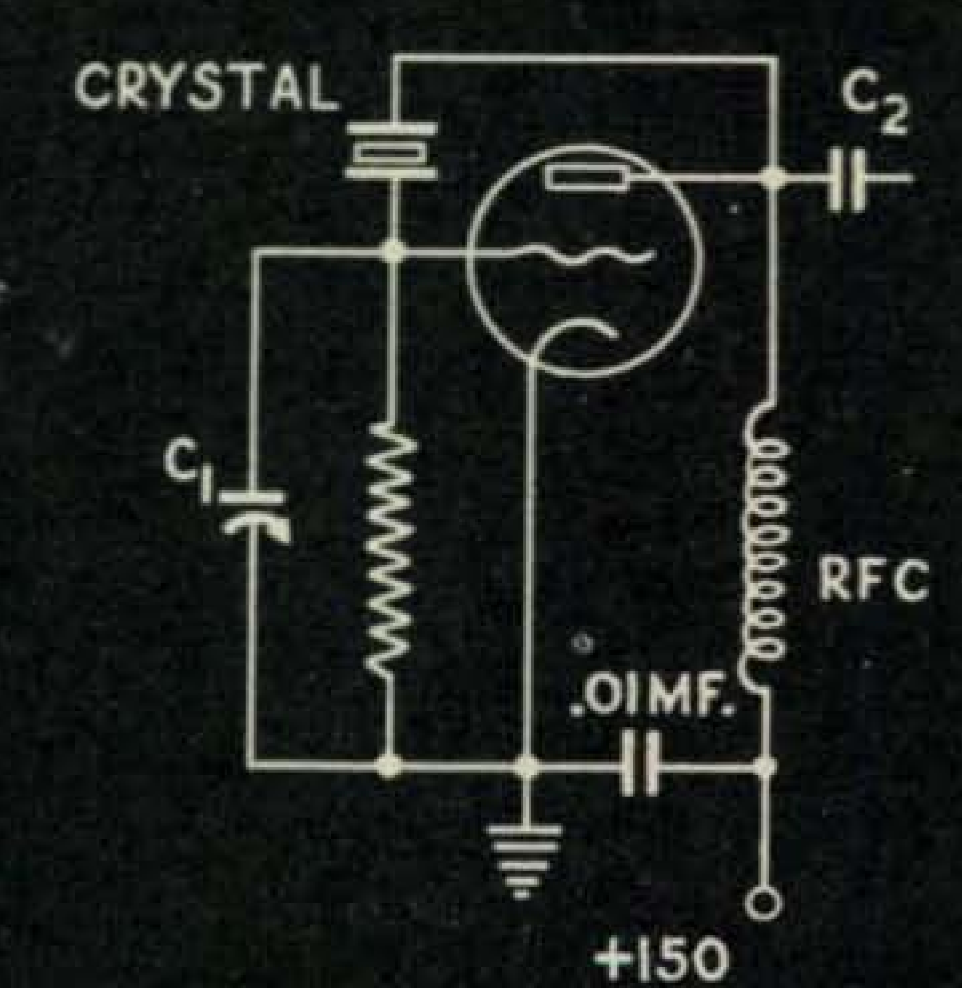


First for amateur frequencies

OVERTONE OSCILLATOR CIRCUITS



GRID CATHODE OSCILLATOR



GRID ANODE OSCILLATOR

Way back in the prewar era Bliley pioneered "harmonic" crystals for amateur frequencies in the 10 and 20-meter bands. Nowadays we know that such crystals should be correctly termed "overtone" oscillators because the crystal does not oscillate at the exact mathematical harmonic of its fundamental frequency. The present Bliley AX2 unit for 20-meter operation contains an overtone crystal designed to oscillate at approximately three times the fundamental mode.

When using overtone crystals the following considerations should govern circuit design:

1. *Grid Anode Crystal Oscillators*—In normal circuits of this kind crystals will usually oscillate at the fundamental mode instead of the overtone frequency desired because the plate impedance is usually capacitively reactive at the fundamental mode. To insure operation only at the overtone frequency the plate coil and the plate capacity must be selected so that the equivalent plate impedance is capacitively reactive at the overtone frequency of the crystal but not at its fundamental frequency.

   Optimum conditions should be such that the plate tank will be broadly resonant about half way between the fundamental and third overtone frequency. Since these conditions are sometimes difficult to establish when using choke coils the grid anode circuit is not recommended for use with overtone crystals.

2. *Grid Cathode Crystal Oscillators*—In most of these circuits the plate tank impedance must be inductively reactive and maximum output with good stability is obtained when the plate tank circuit is approximately tuned to the crystal frequency. Proper selection of the coil and condenser values for tuning to the desired overtone frequency is straight-forward procedure.

Bliley CRYSTALS

Write for Bulletin 31

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA

• • Letters • •

The Ham Spirit!

Kennebunk, Maine

Editor, *CQ:*

I want to take this opportunity to thank you for running the request in *CQ* on information re the German transceiver. I received two communications immediately, one from W2LLZ and another from an unknown friend in Manchester, Conn. The Ham Spirit—perhaps not so much in evidence in late years—still exists!

Bertram W. Hansom, W1BWB

SWLs

36 East Parker Street, Waterloo, Iowa

Editor, *CQ:*

As an SWL, I find that the QSLing business is not at all as good as it should be. I think the hams would appreciate the short wave listeners reports on their station and also the time and money we take to advise them of such. I find that out of every hundred SWL cards I send out about 50%, at the most, are ever acknowledged. I should like to suggest that a club of some sort be established to bring the SWLs together and that the sole purpose of this club be to sell hams the idea that we mean (to do) good. The better part of the group will in time, no doubt, become hams.

William C. Harper

More information, more accurate reports, and reports under unusual conditions will help the average amateur. But as far as percentage returns on cards are concerned 50% is quite high even for a practicing amateur. It is a disgrace, quite inexcusable, and a situation that should be remedied promptly.—Ed.

Illegal Operations

1949 First Ave. East, Cedar Rapids, Iowa

Editor, *CQ:*

The FCC letter in February *CQ* is further underscored by a piece appearing in the local newspaper recently. FCC investigators closed the unlicensed station operated by Robert A. Sperry of this city. He was particularly fortunate that he received nothing more severe than a warning. Incidentally, he was operating illegally as far back as December, 1945.

Charles W. Boegel, Jr., WØCVU

Licensed amateurs who come across this sort of thing owe it to themselves to turn the offender into the authorities. Condoning unlicensed operation is almost as serious as doing the operating.

Organized Net Frequencies

157 Logan St., Bedford, Ohio

Editor, *CQ:*

In view of the extreme pressure being brought to bear, upon the coming International Radio Congress, by the various commercial and International interests, it behooves the amateur radio operators to be on the alert to show only useful and favorable services to the armed forces and the general public.

Useful traffic handling is one of the best ways of doing this. Many state and trunk line networks for

traffic have been organized to expedite this message work. These nets . . . are doing very good work to bring about this favorable notice to the armed forces authorities, etc.

More and more serious interference, caused by other amateurs calling CQ and having rag-chewing QSOs is seriously interrupting traffic handling work of the organized nets. This shouldn't happen, because unless we keep in the favor of our own armed forces authorities, we are very apt to lose some of our frequencies and be cut down in power allowed (or both).

I would like to ask . . . amateurs who are not interested in traffic handling to please refrain from doing any radio transmitting on the regular organized net frequencies and at the scheduled times the nets are in operation. . . . They would not only be helping the nets to move message traffic, but in the long run would be doing themselves a lot of good in the way of hoped for continuance of our present frequency bands and power input allowances.

Charles F. Lohner, W8RN

NBFM

201 East Morrison St., Santa Maria, Calif.

Editor, *CQ:*

. . . . If NBFM is the coming thing on the lower frequencies (75 and 20), how about plugging for a power limit of 4 kw so we can run the same peak power as before. Which reminds me that there is nothing new under the sun. We used to work the east coast with a 210 on 85-meter phone, 20 to 40 watts input, loop modulated, about 5% amplitude modulation and about 4 kc of FM. With the blooper receivers screwed up just under oscillation I'm sure the FM was doing most of the work. The "we" refers to a large number of old time W6s, but of course a lot of the east coast boys they worked were using the same thing.

W. W. Smith, W6BCX

Radio Control Model Airplanes

103 Veterans Court, Reedley, Calif.

Editor, *CQ:*

I am in need of help. Have been working on about twenty different circuits for radio control of model airplanes. The troubles I have are too numerous to mention . . . but how about hearing from other hams who have done work in this fascinating branch of our hobby?

Eugene J. Orrico, Jr., W6WGA

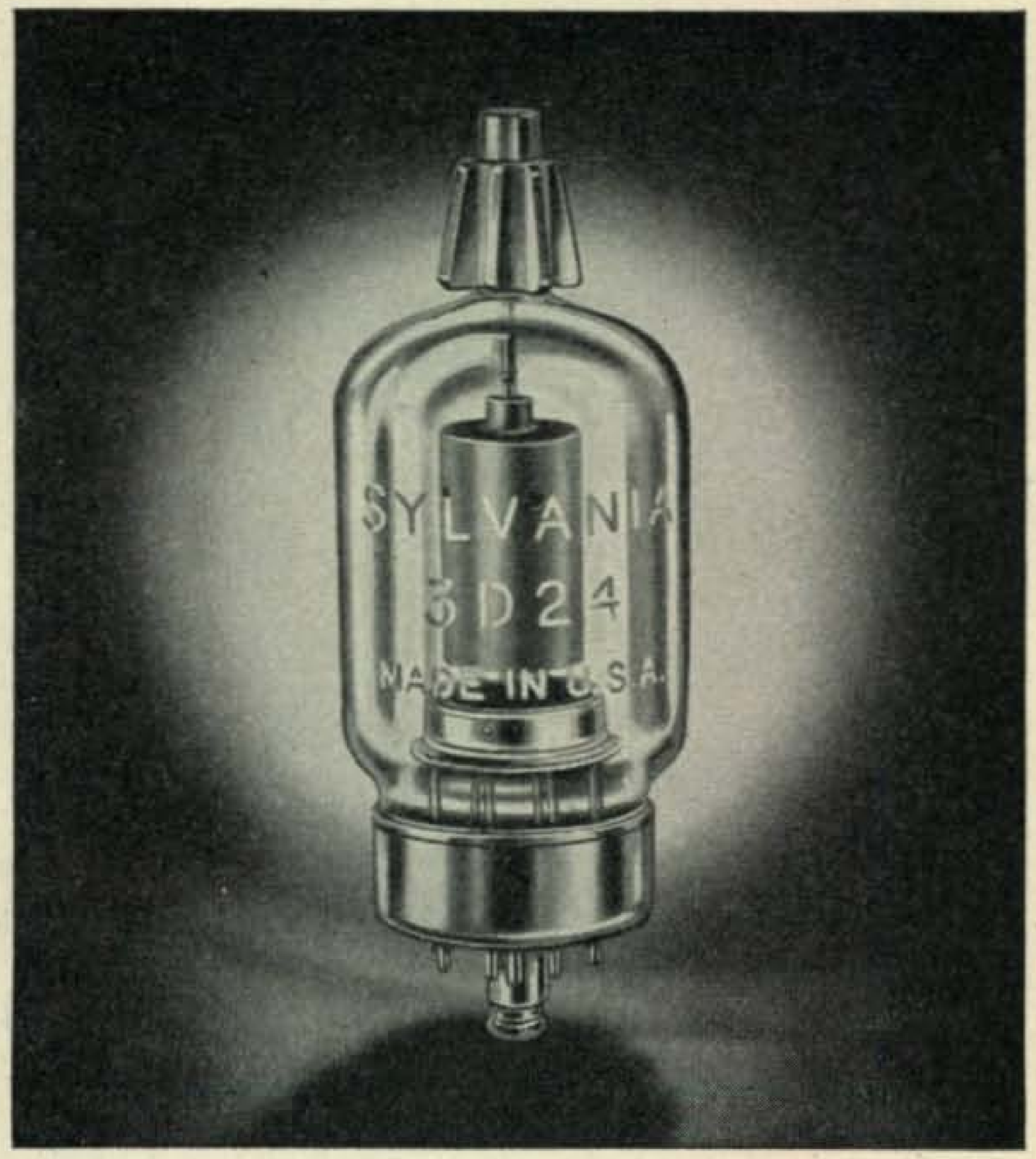
Nothing would please us more than to receive some good editorial material on radio control of model aircraft, boats, and cars. Since a license is required to work with this type radio control it is safe to assume that amateurs are behind almost all of the radio control work being done in this field. We would welcome hearing from some of you.—Ed.

Letters is our readers forum. We'd like to publish opinions and information which would be of interest to CQ readers. Correspondence will not be altered, except for an occasional shortening of a letter, however the editors reserve the right to select material published. Naturally CQ doesn't necessarily endorse all the views expressed in this column. We'd like to hear all your pros and cons though, so come on gang, write in.

NOW you can get Sylvania quality in TRANSMITTING tubes too!

SYLVANIA INTRODUCES THE TYPE 3D24

BEAM POWER TETRODE WITH ELECTRONIC GRAPHITE ANODE



First of Sylvania's new line of transmitting tubes, the 3D24 is a four-electrode amplifier and oscillator with 45 watt anode dissipation. An outstanding development is the electronic graphite anode, which allows high plate dissipation for small area and maintains constant interelectrode relationship and uniform anode characteristics.

The 3D24 may be used at full input up to 125 Mc—maximum permissible frequency will be announced later upon completion of tests.

OTHER FEATURES INCLUDE:

1. **Top cap** providing for short path, greater cooling by radiation and convection, resulting in a cooler seal.
2. **Thoriated tungsten filament,** giving high power output per watt of filament power.
3. **Vertical bar grids.** #1 grid supplied with two leads for better high frequency performance. #2 grid provided with heat-reflecting shield for greater dissipation, low grid-plate capacity.
4. **Low interelectrode capacity.** No neutralizing needed with proper circuit arrangement.
5. **Hard glass envelope.** Permits high power for small size.
6. **Lock-In base.** Short leads, no welded or soldered joints.

The 3D24, a product of the Electronics Division of Sylvania Electric, has interesting potentialities in amateur, police, mobile and marine radio.

MECHANICAL SPECIFICATIONS

Type of cooling	Air—radiation and convection
Mounting position	Vertical, base down or up
Length overall	4.3 inches max.
Seated height	3.769 inches
Diameter	1½ inches
Net weight	1.3 ounces

ELECTRICAL CHARACTERISTICS

Filament Voltage	6.3 volts
Filament Current	3.0 amperes
Amplification Factor	50
Direct Interelectrode Capacitances	
Grid-Plate	0.2 μμf max.
Input	6.5 μμf
Output	2.4 μμf
Maximum Class "C" Power Input	180 watts C.C.S.

Direct inquiries to Radio Tube Division, Emporium, Pa.

SYLVANIA ELECTRIC

MAKERS OF ELECTRONIC DEVICES; RADIO TUBES; CATHODE RAY TUBES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

Amphenol AND RADIO AMATEURS HAVE ALWAYS WORKED TOGETHER

Radio amateurs are the most versatile technical experimenters known—and so are Amphenol engineers. Amateurs have pioneered the greatest share of electronic developments since the dawn of radio—and Amphenol has pioneered in the development of components used by hams.

Amateurs have an appreciation of the electrical engineering problems in the production of components to give the best performance. They agree that Twin-Lead, pioneered by Amphenol, is one of the most important and useful new products in the field of electronics.

75 OHM TRANSMITTING TWIN-LEAD

Amateurs asked for it—now here it is! It's the new *heavy duty* 75 ohm Amphenol Twin-Lead transmission line. Conservatively rated at 1000 watts for 30 Mc. or lower frequency. Available—now—at your distributor's.

	Megacycles	75 ohm DB per 100 ft.
Attenuation	3.5	0.29
	7.0	0.49
	14.0	0.82
	28.0	1.40

Receiving Twin-Lead is available in 75 ohm, 150 ohm and 300 ohm impedances. Get a copy of Amphenol's new Twin-Lead bulletin from your dealer.

Other Amphenol products of interest to amateurs available at your dealer's:

Radio Tube Sockets. Industrial, standard, miniature and sub-miniature—plugs and accessories. Octal angle sockets for cathode ray applications.

Connectors. All types, with fittings—from 1 to 50 contacts.

Cables. Coax and Twinax (also connectors). Microphone cables (also connectors).

Plastics for Electronics. Plastic sheets, rods and tubes. Flexible tubing and spaghetti. Coil Dope. Molded coil forms, stand-off insulators, knobs and dial pieces.

Antennas. UHF dipoles and arrays.

AMPHENOL

AMERICAN PHENOLIC CORPORATION
CHICAGO 50, ILLINOIS
In Canada • Amphenol Limited • Toronto, Ontario

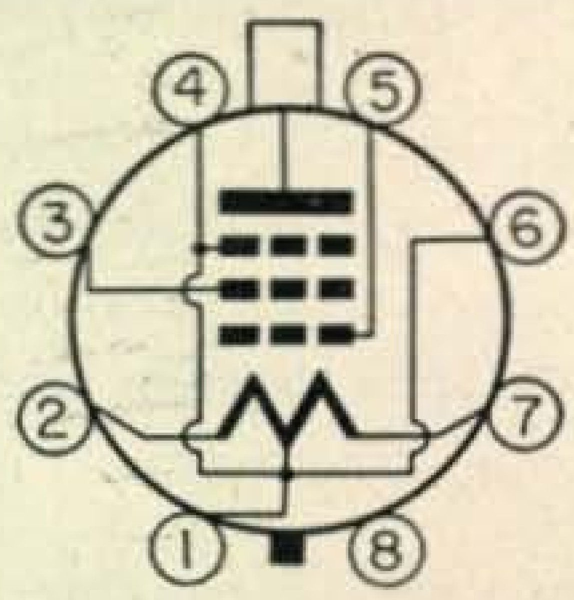
COAXIAL CABLES AND CONNECTORS • INDUSTRIAL CONNECTORS, FITTINGS AND CONDUIT • ANTENNAS • RF COMPONENTS • PLASTICS FOR ELECTRONICS

NEW 5516 INSTANT-HEATING VHF BEAM PENTODE

18 WATTS — **USEFUL POWER OUTPUT FOR MOBILE F-M WITHOUT NEUTRALIZATION** — **165 MC**

IT WAS NOT EASY . . . Compact though it is, the new 5516 is a far cry from the cathode-type tubes previously used in mobile vhf equipment. Design and production headaches for instant-heating vhf beam pentodes increase in geometric progression with the operating frequency. A glance at 5516 constructional advantages discloses unusual measures taken to solve such problems. Yes, the 5516 of necessity costs more, but it does a *real* job at 165 mc.

WHAT THE 5516 DOES FOR YOU . . . 5516 useful power outputs at 165 mc of 18 watts f-m, 12 watts a-m (more at lower frequencies) are not theoretical but are based on actual tested transmitter designs. Low internal tube drop gives high output at low plate potential, with simplified power supply requirements. Instant-heating filament permits tremendous savings in battery drain — mobile or aircraft. One 2E30 doubler or tripler drives a 5516 in plate-modulated class C to full output at 165 mc. Ratings — designed for mobile use — are CCS and equally suitable for the fixed station. Also the 5516 requires no neutralization in properly designed circuits. Write today for complete data sheet.



BASING — BOTTOM VIEW

Pin	Connection	Pin	Connection
1	Fil. center tap & beam plates	5	Control grid
		6	Same as pin 1
2	Filament	7	Filament
3	Screen grid	8	No connection
4	Same as pin 1	Cap	Plate

HYTRON TYPE 5516
INSTANT-HEATING VHF BEAM PENTODE

GENERAL CHARACTERISTICS

Filament	oxide-coated, center-tapped
Potential (a-c or d-c)	6.0 ± 10% volts
Current	0.7 ampere
Grid-plate capacitance	0.12 max $\mu\mu$f
Input capacitance	8.5 $\mu\mu$f
Output capacitance	6.5 $\mu\mu$f
Maximum overall length	3-21/32 inches
Maximum diameter	1-7/16 inches
Base	low-loss, medium-shell, 8-pin octal

ABSOLUTE MAXIMUM CCS RATINGS

		Mod.*	Unmod.	
D-c plate potential	80 mc	475	600	v
	135 mc	395	500	v
	165 mc	355	450	v
D-c plate power input	80 mc	30	45	w
	135 mc	26.5	40	w
	165 mc	23.5	35	w
D-c plate current		75	90	ma
D-c screen potential		250	250	v
Plate dissipation		10	15	w

USEFUL POWER OUTPUT (CCS) — TYPICAL OPERATION#

Service	*Up to: 165*	*135*	*80*	mc
Class C unmod. or f-m	18	24	30	w
Class C plate-modulated	12	16	20	w

*Carrier condition with max modulation percentage of 100. #Useful power output to load equals plate power output less circuit and direct radiation losses.

5516
CONSTRUCTIONAL ADVANTAGES

- Zirconium-coated plate, gold-plated control grid, carbonized screen grid enable maximum possible vhf ratings, despite compact size.
- Special, rugged filament suspension avoids short circuits and burn-outs in rigorous mobile applications.
- Three separate base-pin connections to filament center tap provide for lowest possible cathode lead inductance.
- Dishpan stem and compact structure give short, heavy leads with low inductance and capacitance.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON
RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

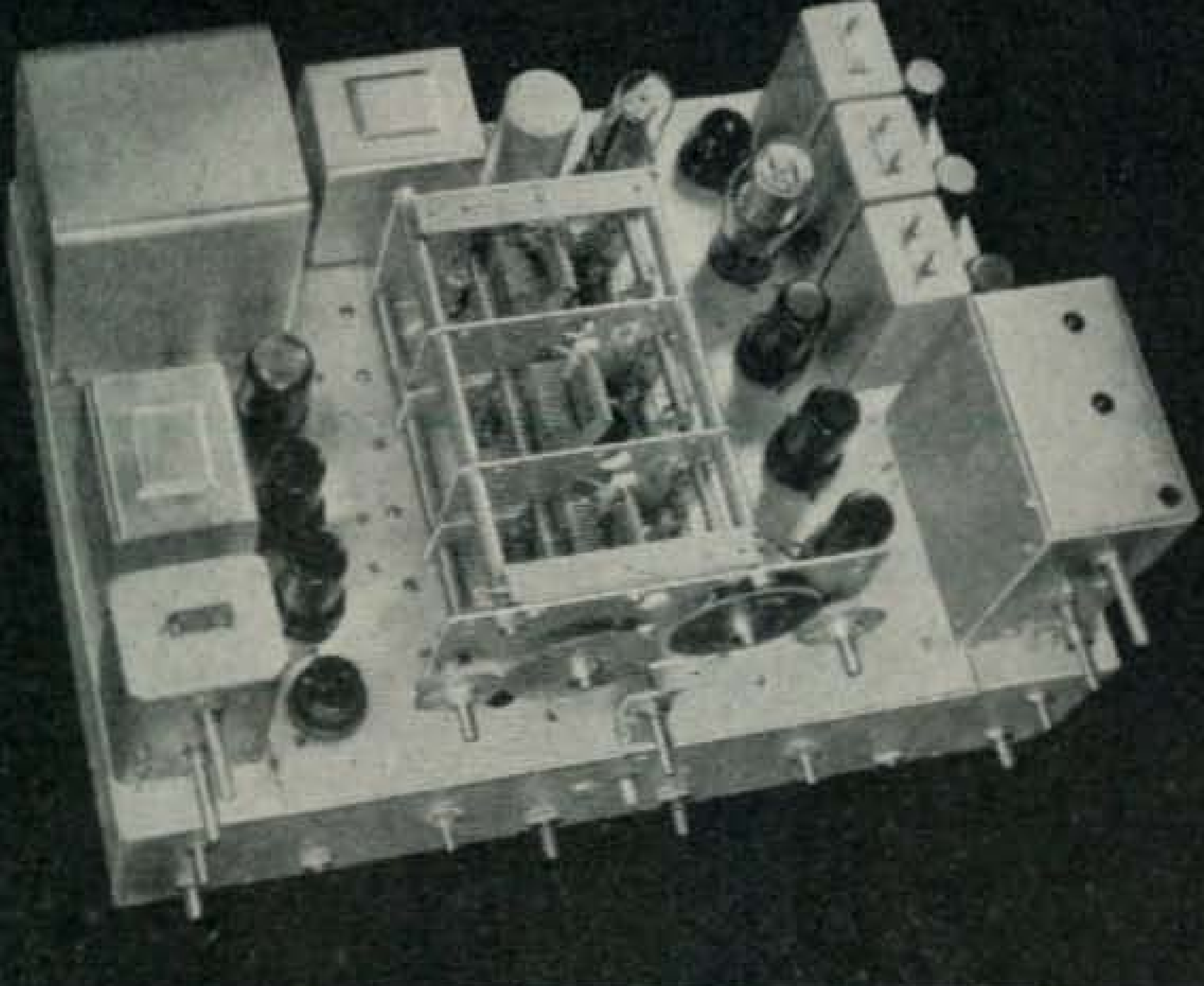
READY NOW

IN ANSWER TO HAMS' DEMANDS

EST. 1914

Hams around the world have been National's collaborators in creating the NC-173—ready now after five years of intensive research. Here are some of the advantages this 13-tube superheterodyne receiver offers:

- The NC-173's newly designed adjustable threshold double diode noise limiter—working on *both phone and* CW—has an extremely high limiting efficiency because of the short recovery time.
- Voltage regulated circuits give the NC-173 high stability and less drift for changes in powerline voltage. The pitch of code characters barely changes—even over extended listening periods.
- The S-meter circuit allows signal strength recordings to be taken on either *phone or code.*
- Works equally well on coaxial feed-line, single-wire, directional or balanced antenna.
- AC powered. Will also operate on battery for portable or emergency use —110/120 or 220/240 volts, 50/60 cycle. Frequency range .54 to 31 and 48 to 56 MC. (Includes calibrated band spread on 5, 10, 11, 20, 40 and 80 meters).
- Ask your dealer to let you see and hear the new moderate-priced NC-173.



THE NATIONAL NC-173

NATIONAL

COMPANY, INCORPORATED

MALDEN, MASS.

THE MOST DISTINCTIVE NAME IN RADIO COMMUNICATIONS

. . . *Zero Bias* . . .

QSL?

Some months ago we lightly touched on the subject of QSL cards, pointing out that exchanging cards is still a grand part of our hobby. Considerable correspondence from amateurs throughout the world was received—most of it complaining about the failure of many amateurs to QSL.

We know that thousands of hams feel exactly the same way we do about failure to answer a QSL card. It is just plain rotten on the part of the non-QSLer. Of course there are extenuating circumstances, particularly in some foreign countries where cards are expensive and the volume of correspondence tremendous. But the average amateur is not in such a predicament. Failure to QSL is just plain neglect. Even a picture postcard would suffice in many instances, but too frequently the course of least resistance is followed and the card goes into a pile to be answered "some day."

What do statistics on QSL percentages in the average ham station look like? At our own station we have kept a careful post-war record and the percentage of hams who have answered our card is deplorably low. A total of about 55%, covering operation on phone and c.w. on all bands, of our cards have been answered. Although it has not been our practice to send out many W QSLs because of the existing shortage of cards, Americans have a remarkably high average. Over 90% of the W contacts answered a card. We know that some DX stations will take exception to this figure, but in our case W returns have been above average.

DX returns average about 40 per cent. Perculiarly, there are some very sharp divisions by bands. Ten and 40 both average about 15% better results than 20. A logical explanation would be the DX stations work so much more stuff on 20 that they are the individuals swamped with cards, but you can hardly apply that rule to 10, or as a matter of fact to 40, the way it has been open for DX lately.

Phone and c-w returns average pretty much the same, with the phone stations showing a slightly better average on DX. Some countries are quite good, whereas others are almost ridiculous. Over 50 VKs were worked over a short period of time. Allowing for extremely slow mail both ways, only 1 VK card has been received to date. English stations are very good as are most of the Scandanavian countries, but South Americans are notably lax on QSLing. Perhaps it is not fair for us to generalize in this manner. The facts indicate merely that far too few hams are showing the true spirit. A card is not something to be idly tossed aside, it might better be looked upon as a moral obligation that isn't filled until you've acknowledged in kind.

Take a good look in the mirror and make sure you're not one of the people we are talking about!

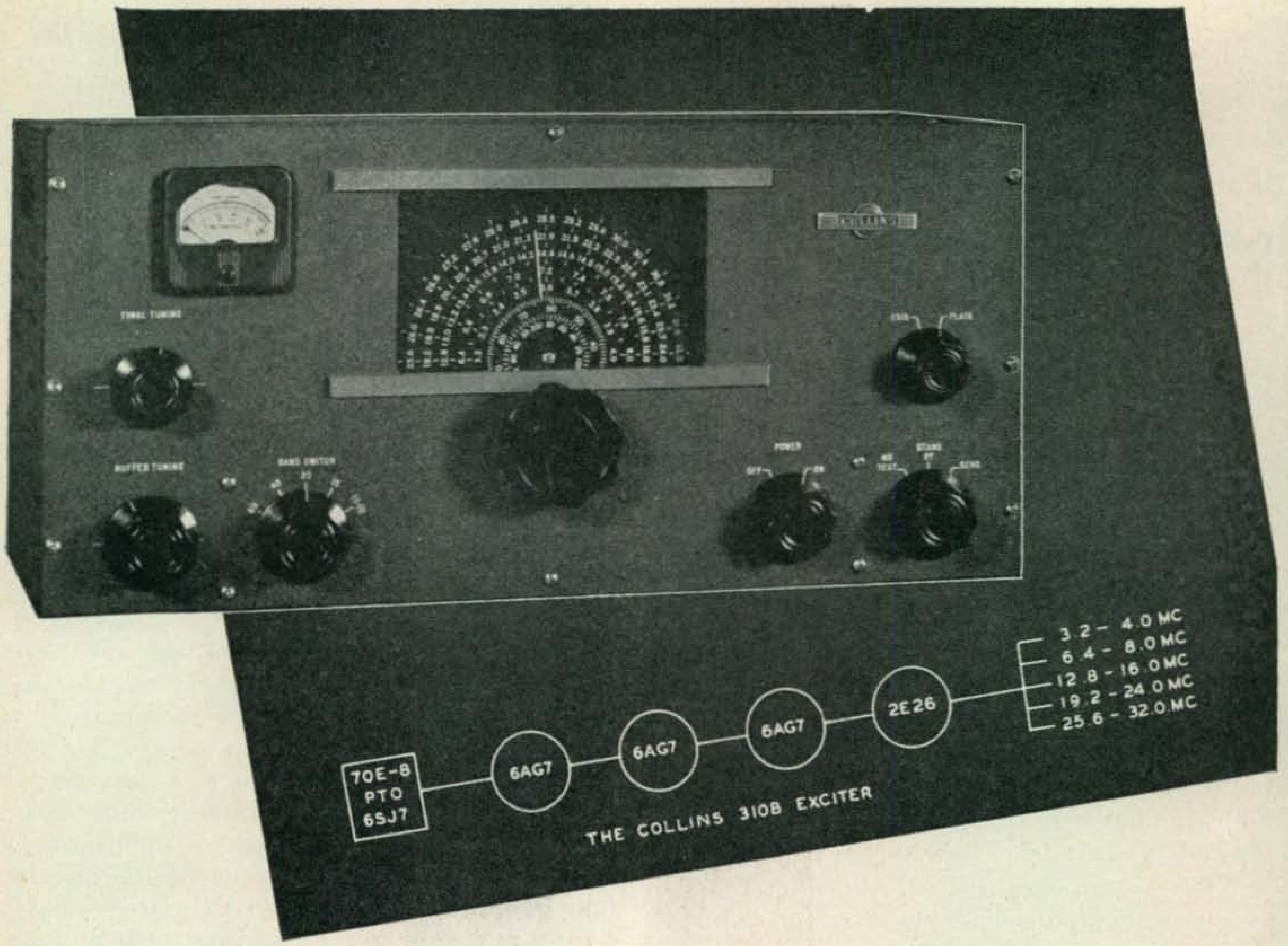
Amateur Politics

February *Zero Bias* seemed to get a lot of fellows thinking. We are mighty pleased it had this reaction, because that is exactly what it was supposed to do. Letters asking "what is the next move" are best answered in this same page. Stay interested! Keep making your likes and dislikes known to your amateur representatives or spokesman. One way you can make your personal views known is to address a note to our letter columns. They are a forum for the ham, where letters of general interest are published.

Another way is to keep your ARRL director fully informed of your views. Along these lines it is gratifying to note that advisory polls are now to be a regular part of the amateur organization. This is only right—it is the truly democratic way to run things and there can be no questioning the final results of a poll. For the first time it will give directors an accurate picture from all their constituents. It is a truly progressive move and one that will be welcomed by all thinking amateurs everywhere.

Let's Brag a Bit

Every now and then we open a letter that contains a clipping about some amateur and his latest achievements. We know that many such items appear that are never brought to our attention. Likewise there are countless times when some newsworthy material is not called to the attention of the press. At our office we frequently get an opportunity to pass along such information—publicity that will do the entire amateur fraternity a lot of good. Publicity of the right kind is a wonderful thing for our hobby. It isn't conceit to write us—it is a good deed. Thousands of citizens have no knowledge whatsoever about ham radio. Local papers, even national publications are interested in printing good material with the natural appeal of our hobby. Pass on anything you feel will interest us and we will have it on hand when the proper opportunity presents itself. Let's brag a bit . . . we really have something in amateur radio.



The Collins 310B Exciter puts

Versatility and Precision into your rig

The 310B is the answer to many requests for a multi-band exciter utilizing the Collins 70E-8 P.T.O. (Permeability Tuned Oscillator). Conservatively rated at 15 watts output on all amateur bands up to 30 mc, it will drive a kilowatt pentode final on phone or cw. It provides accuracy and stability of ½ kc on 80 meters, and precision control on all bands.

The bandswitching buffer stages are ganged, condenser tuned, and permeability trimmed. All trimmers are adjusted from the top of the chassis. In the M. O. Test position the plate voltage is removed from the output tube; thus the exciter can be tuned while you listen to a received signal. The power switch can be interconnected with other equipment so that one switch controls the entire transmitter.

The 2E26 output tube has protective bias for keying purposes. Clean keying is accomplished in the cathode of the first 6AG7. Metering is provided for the 2E26 grid and plate currents. Output coupling is by means of a link on the plate tank coil.

Enjoy the many advantages of this new exciter. Use it also in your 6 meter and 2 meter rigs. The 310B makes multi-band operation a pleasure. Write now for full details and the name of your nearest dealer.

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

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street, New York 18, N. Y. **458 South Spring Street, Los Angeles, 13 California**

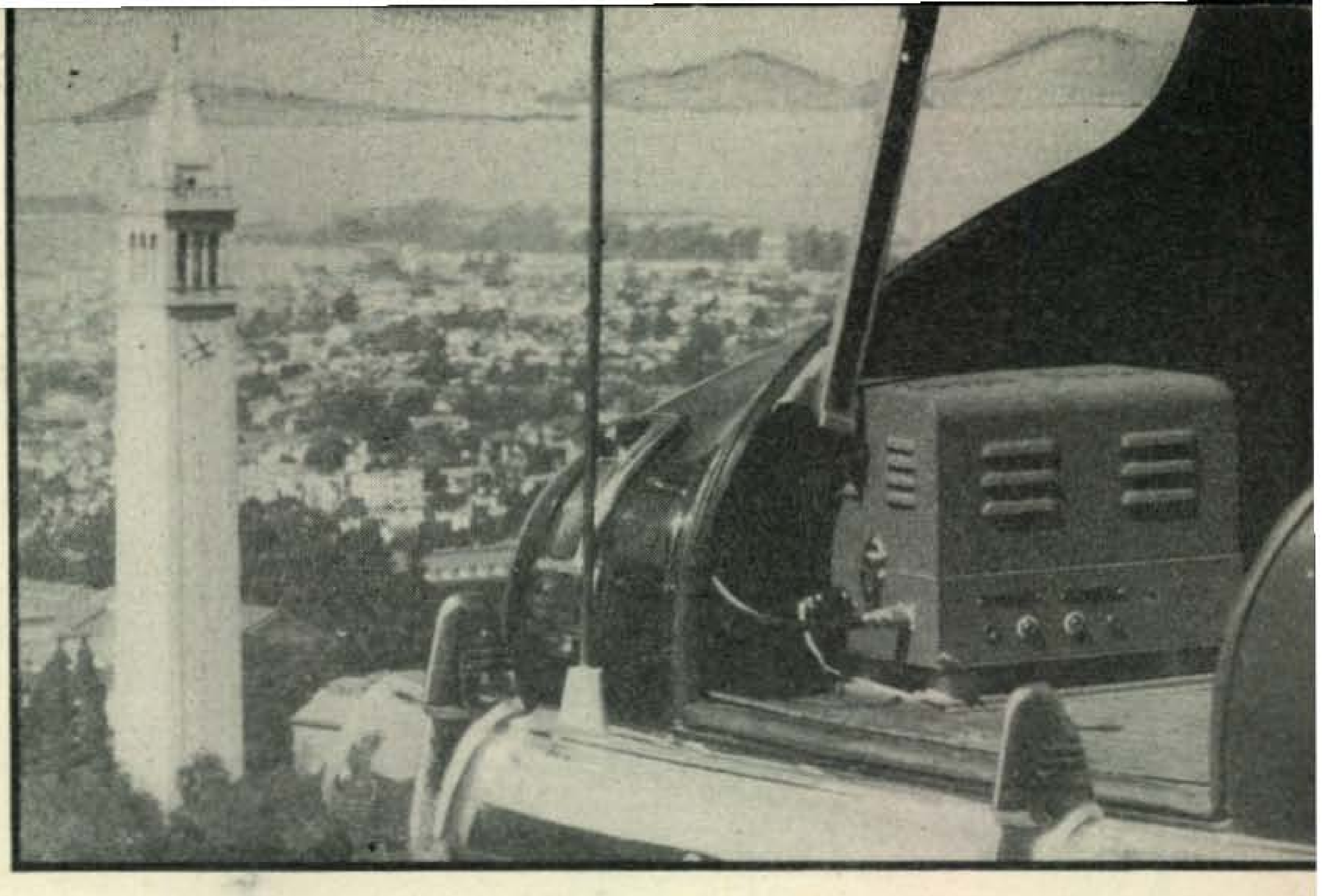


Fig. 1. An ideal location and an ideal portable mobile rig for 10-meter operation. Using an 829B in the power amplifier input is approximately 50 watts.

C. T. HAIST, W6TWL*

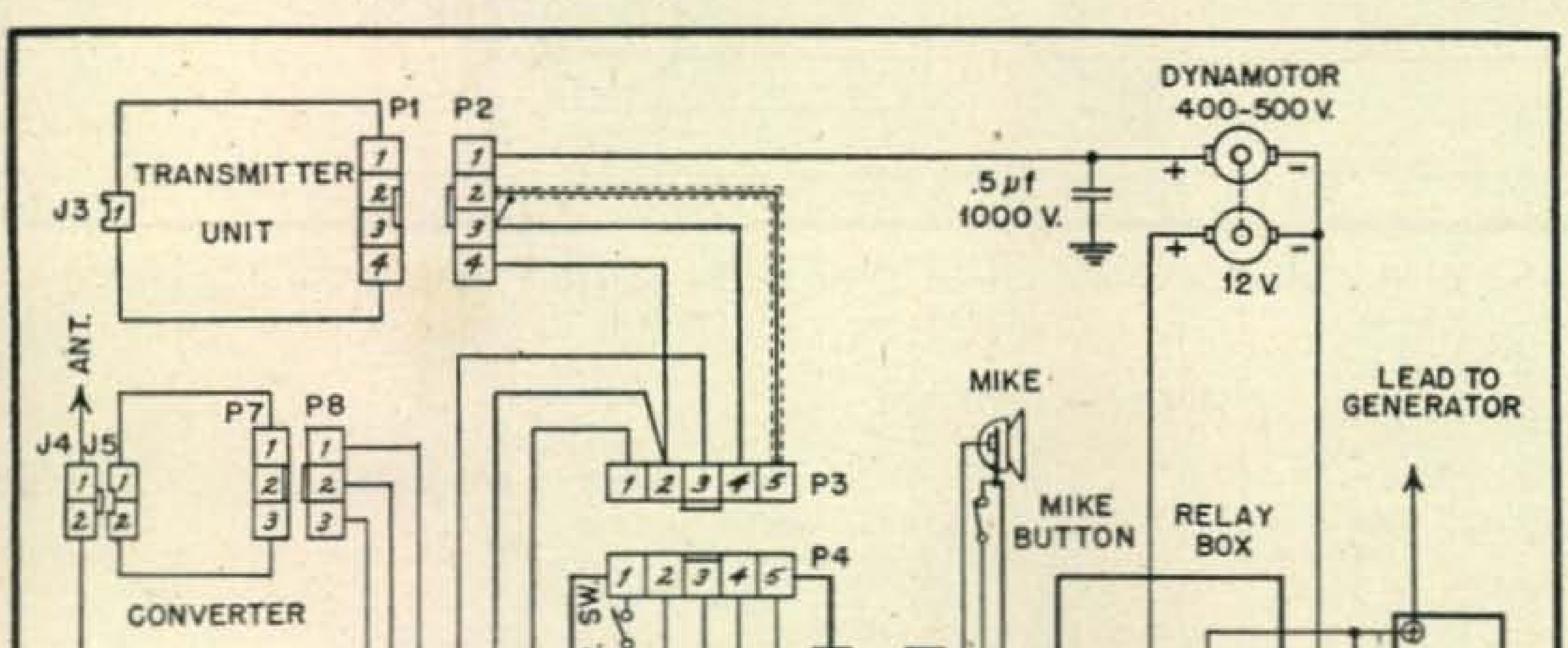
A Complete 10-Meter MOBILE STATION

IT SEEMS THAT almost every ham who has been associated with the electronics equipment used by the Armed Forces during the war possesses an 829B high-frequency transmitting tube. The writer, being no exception, decided to put this tube to work in a 10-meter mobile rig, where its ability to produce lots of r.f. with low grid drive makes it an ideal tube for a simply constructed and easily adjusted high-powered mobile rig.

A 6AG7 tube used in a harmonic crystal oscillator circuit has enough output to drive the twin tetrode 829B. With a 7-mc crystal this tube will drive the 829B to 5 or 6 ma grid current when operating on 28 mc. To simplify transmitter construction and tuning, only two coils and two variable condensers are used. The plate coil of the 6AG7 is wound between the two push-pull input grid coils. By tuning the grid circuit of the 829B to resonance, the plate circuit of the 6AG7 oscillator is automatically tuned because the plate coil is so closely coupled to the grid coil.

The push-pull output of the 829B is coupled to a quarter wavelength antenna by a short piece of

*750 Warfield Av., Oakland, Calif.



Block diagram of complete mobile station showing principal unit and control wiring. Station is entirely controlled from push-to-talk microphone.

RG 13/U coaxial cable. Input power to the final is approximately 50 watts. Two 6F6 tubes are used in class AB2 operation to modulate the final amplifier. A transformer-coupled 6C5 drives the push-pull grids of the 6F6s. Nearly 20 watts of audio are obtained with a good single-button carbon mike.

With the war surplus offering some good buys in dynamotor power units, no trouble should be experienced from that standpoint. The dynamotor used with the rig built by the writer is a 12-volt aircraft unit delivering 475 volts at 300 ma. It is powered by an extra 6-volt battery in series with the car battery. The extra battery is installed under the front seat of the car and regular battery cables are brought up to a relay control box located close to the original car battery. A 6-volt DPDT relay is used to connect the two batteries for charging or operating. In the normal position of the relay, the added 6-volt battery is connected in parallel with the car battery for charging. When the mike button is pressed the relay is energized, connecting the batteries in series to supply 12 volts to the dyna-

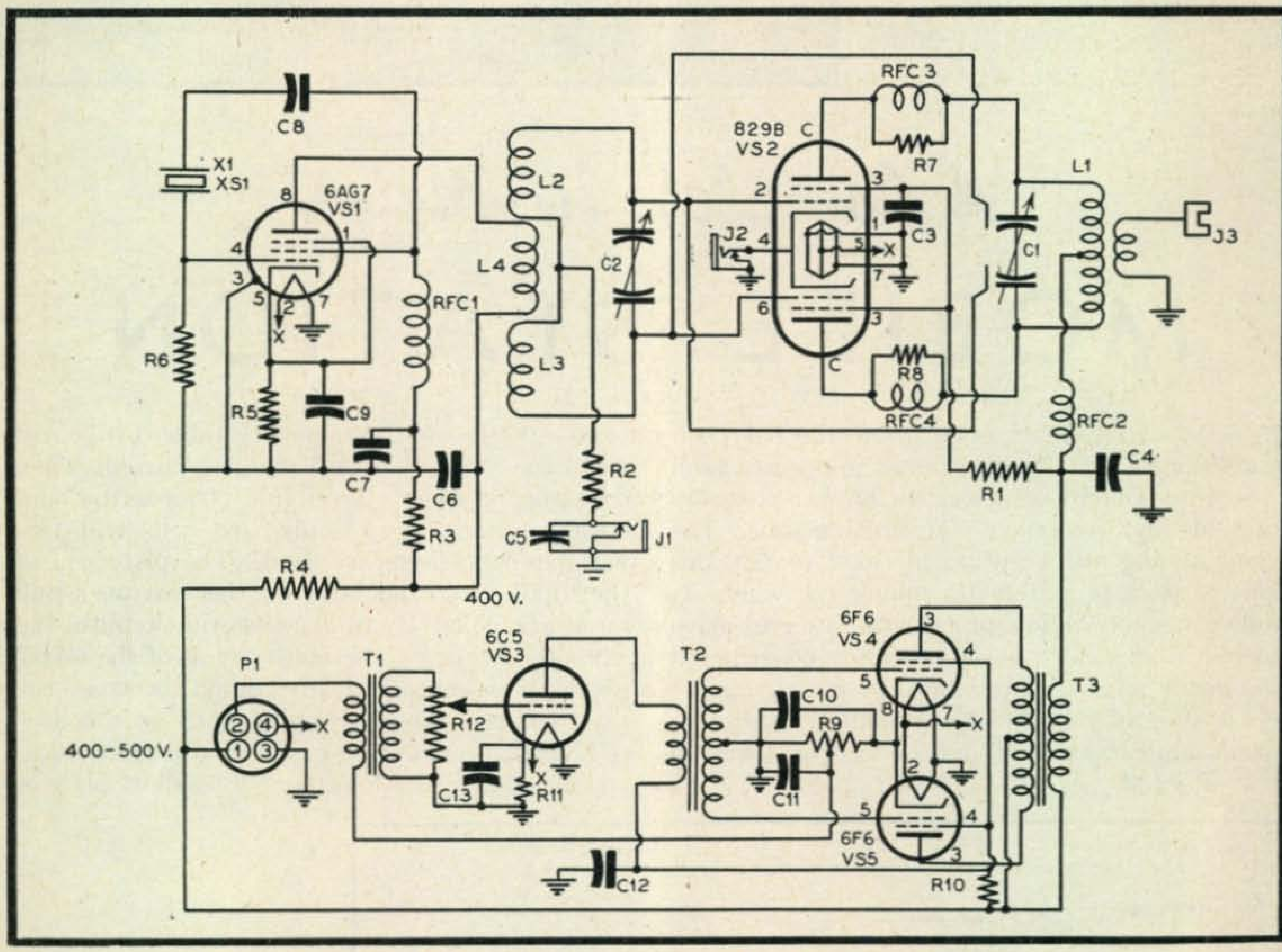


Fig. 2. Schematic of the efficient high-powered 10-meter portable mobile rig.

Transmitter Parts List

C1, C2—35 μμf per section, split stator.
C3, C4, C5, C6, C7, C8,—.002 μf, 600 volts, mica.
C9—.005 μf, 600 volts, mica.
C10, C11—50 μf, 50 volts, electrolytic.
C12—8 μf, 450 volts, electrolytic.
C13—25 μf, 50 volts, electrolytic.
J1, J2—closed-circuit jack.
J3—coaxial cable connector.
L1—10-meter plug-in coil with center link.
L2, L3—5 turns No. 14 enamelled wire, 1" inside dia., ½" long.
L4—9 turns No. 14 enamelled wire, 1" inside dia., ⅞" long.
P1—4-prong socket.
R1—20,000 ohms, 10 watts.
R2, R3—15,000 ohms, 10 watts.
R4—5000 ohms, 10 watts, adjustable.
R5—200 ohms, 1 watt.
R6—200,000 ohms, 1 watt.
R7, R8—50 ohms, 1 watt.
R9—250 ohms, 10 watts, adjustable.
R10—20,000 ohms, 10 watts.
R11—1000 ohms, 1 watt.
R12—500,000-ohm potentiometer.
RFC1, RFC2—2.5 mh choke.
RFC3, RFC4—see text.
T1—mike to single grid transformer.
T2—single plate to push-pull grids transformer.
T3—10,000 to 4500 ohm modulation transformer.
VS1, VS3, VS4, VS5—octal socket.
VS2—829B socket.
XS1—crystal socket. X1—7-mc crystal.

motor. A 0.5 μf, 1000 v. oil condenser across the high voltage output is the only filter used for the power unit.

The transmitter unit is mounted in the rear trunk compartment of the car, as shown in *Fig. 1*. A piece of 1/8" x 9" x 12" aluminum was used for the chassis mounting plate. Since the chassis has a turned-in lip on the bottom side, a retaining strip is fastened to the mounting plate to engage the lip. This is fastened along the back side so when the chassis is placed on the plate and pulled forward, the two pieces are secured. The front side of the chassis is held to the mounting plate by winged headed screws. The mounting plate is supported from the car by four surplus rubber shock mounts.

The Antenna

An 8-foot telescopic chrome-plated auto antenna is used for the quarter-wave vertical radiator. This is mounted on the gravel deflecting plate between the car body and rear bumper. The auto antenna mounting is modified by taking a 1/4" brass rod about 9 inches long and soldering

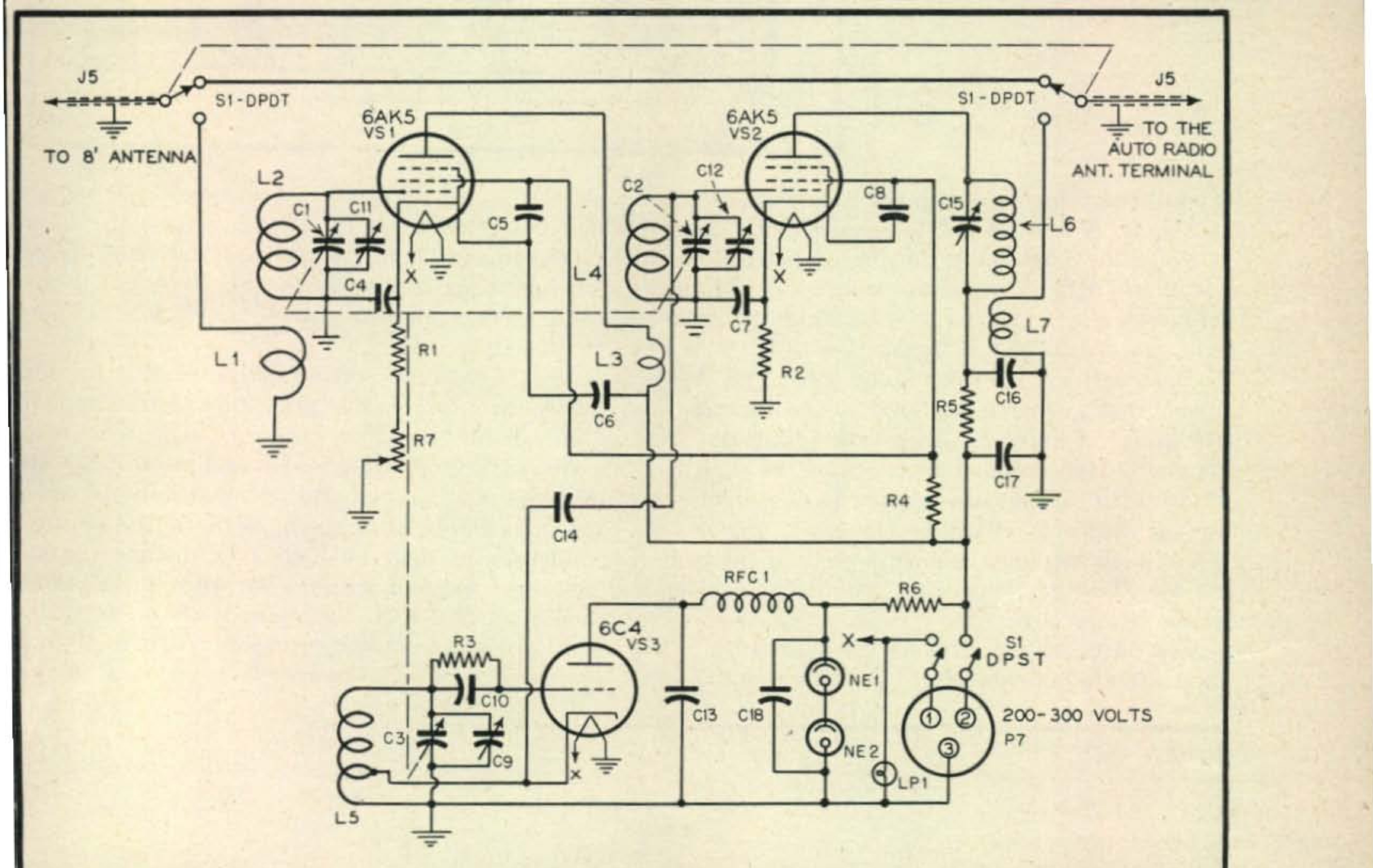
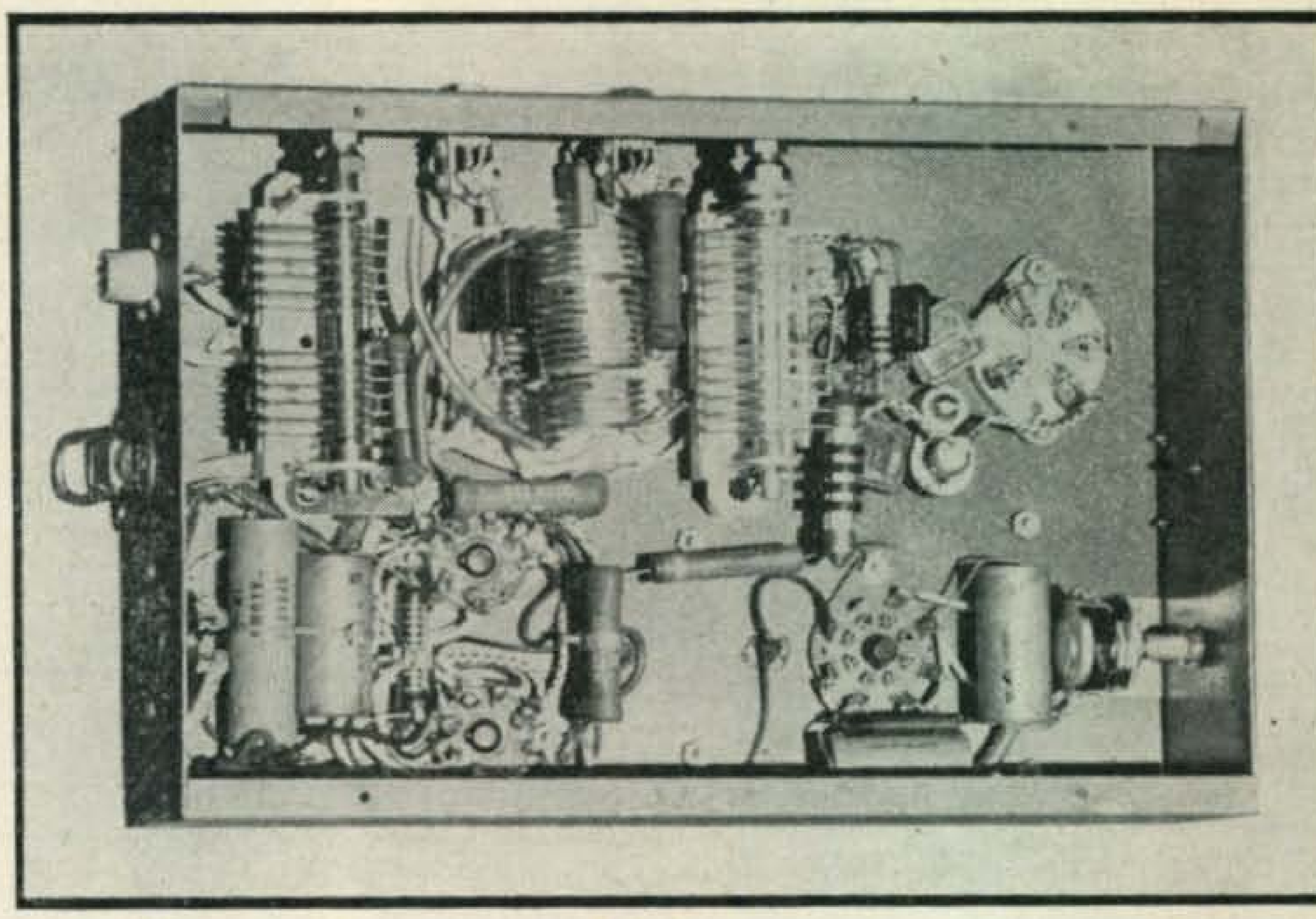


Fig. 3. Schematic of the high-gain 10-meter mobile converter.

Converter Parts List

C1, C2, C3—5 μμf, 3 gang, variable.
C4, C5, C6, C7, C8, C13—.001 μf, mica or paper.
C9—25 μμf, variable padder.
C10—100 μμf, mica.
C11, C12—3-30 μμf, trimmer.
C14—see text.
C15—75 μμf, trimmer.
C16, C17—0.1 μf, 450 volts, paper.
C18—.002 μf, 450 volts, paper.
L1—4 turns No. 20 enamelled wire, 1/2" dia., 1/16" from L2.
L2—12 turns No. 20 enamelled wire, 1/2" dia.
L3—4 turns No. 20 enamelled wire, 1/2" dia., 1/8" from L4.
L4—12 turns No. 20 enamelled wire, 1/2" dia.
L5—9 turns No. 20 enamelled wire, 1/2" dia., tapped at 2 turns.
L6—tuned-radio-freq. coil (see text).
L7—1/16" from L6 (see text).
LP1—6.3 volt pilot lamp and socket.
NE1-NE2—1/25-watt neon lamp.
P7—3-prong connector.
R1, R2—700 ohms, 1/2 watt.
R3—50,000 ohms, 1/2 watt.
R4—30,000 ohms, 1/2 watt.
R5—1000 ohms, 1/2 watt.
R6—20,000 ohms, 1 watt.
R7—5000-ohm potentiometer.
RFC1—5-meter choke.
S1—DPDT toggle switch.
S2—DPST toggle switch.
VS1, VS2, VS3—miniature socket with shields.

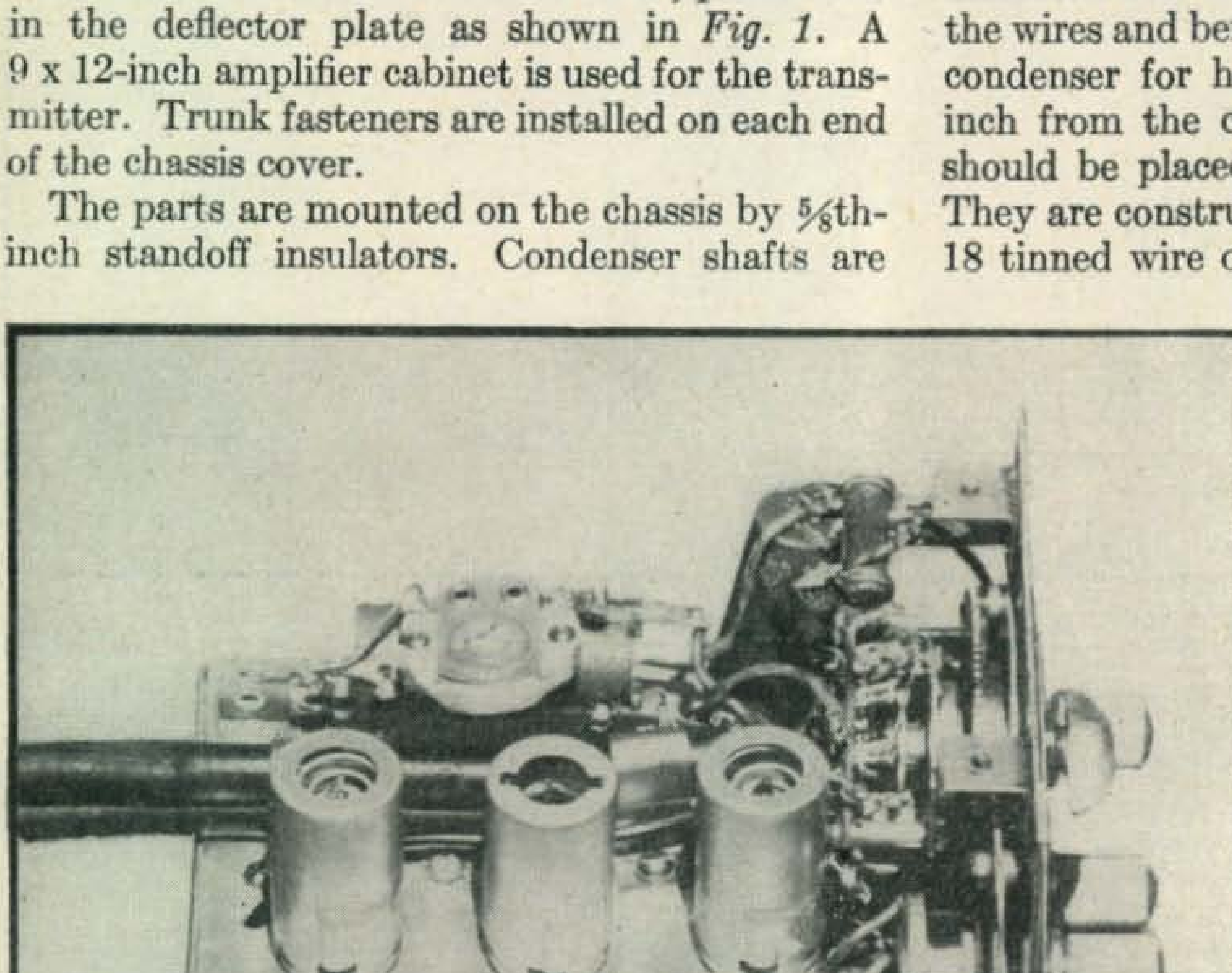
Under chassis view of the 10-meter mobile transmitter



about 4 or 5 inches of it inside the bottom of the antenna. A bushing will be required over the rod if the inside diameter of the antenna used is much larger than the rod. Brass shim stock wrapped around the rod may be used to build up the rod. The end of the rod is threaded with a ¼-20 die for a length of approximately one inch. A ¼-inch brass washer is soldered to the junction of the rod and antenna to provide a shoulder. In assembly, the shoulder rests atop a Johnson No. 46 feed-thru insulator mounted in a ¾-inch hole in the deflector plate as shown in *Fig. 1*. A 9 x 12-inch amplifier cabinet is used for the transmitter. Trunk fasteners are installed on each end of the chassis cover.

The parts are mounted on the chassis by ⅝th-inch standoff insulators. Condenser shafts are slotted on the end with a backsaw for screwdriver adjustments. Plastic grommets are used in the chassis holes to insulate the screwdriver when making adjustments. Shaft locks on the condensers maintain correct adjustment when tightened.

Rotors of both condensers are left floating for better balance of the grid and plate circuits. Neutralizing the 829 is necessary at 28 mc. It is easily accomplished by soldering a piece of No. 10 insulated wire to each grid terminal, crossing over the wires and bending them parallel with the tank condenser for half an inch at a distance of ½ inch from the condenser. Parasitic suppressors should be placed in the plate leads of the 829. They are constructed by winding six turns of No. 18 tinned wire on a quarter-inch form. Remov-



Top view of the mobile 10-meter converter. Two coaxial cables for the antenna input and output lead off to the left. The dial has a gear ratio of three to one.

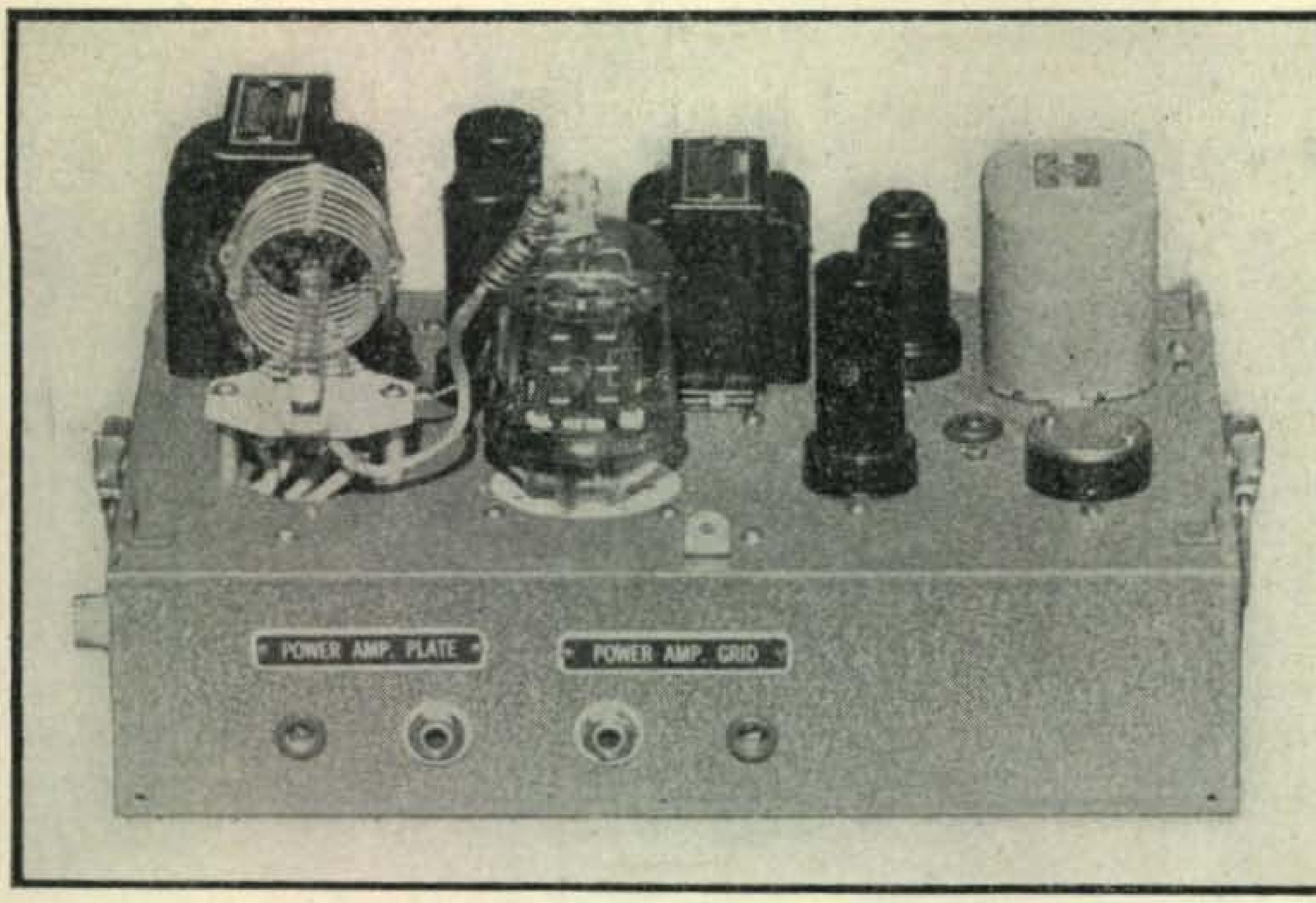


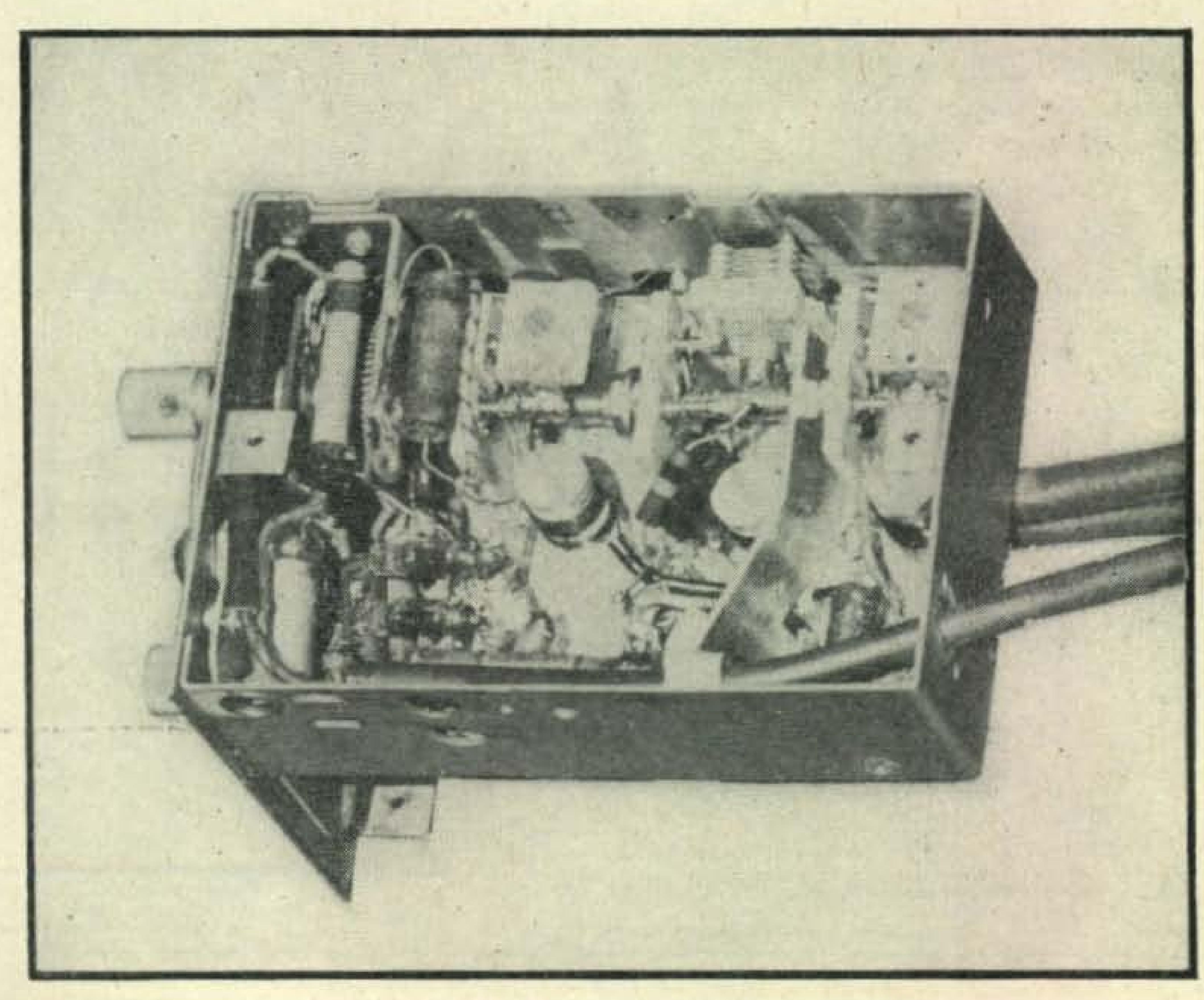
Fig. 4. Top view of the mobile transmitter. The name plates cost little but add much to the beauty and workmanship of the finished article.

ing the form, a 50-ohm, 1-watt resistor is slipped inside and the coil leads are soldered to the resistor at each end.

The grid coil assembly consists of three se parate coils. The coils are self-supporting and the wire is held in place by coil dope. The three coils are placed on a polystyrene strip ½ x 2½ inches long. The two end leads are soldered to the grid terminals of the tube socket, providing a support for the coil assembly. The center coil may be swung in or out to vary the amount of excitation. Maximum coupling, however, will probably be needed.

Initial tuning should be accomplished by first breaking the $B+$ lead to the 829B. The oscillator stage is then checked for oscillation and to make certain the grid circuit of the 829 is pulling the plate circuit of the oscillator into resonance. *R4* is adjusted to apply about 400 volts to the oscillator plate. Tuning the grid circuit to resonance should supply approximately 5-ma grid current. With the antenna disconnected, tuning the plate tank condenser from one extreme to the other should indicate if self oscillation is present. Grid current will drop when the tank circuit is tuned through resonance if oscillation is present. Move the neutralizing wires, either closer or farther away from the condenser, until no change in the grid current occurs. The $B+$ lead to the 829B may now be connected and the plate tank condenser tuned to resonance. Minimum cathode current at resonance will be some 20 to 30 ma since this represents plate, grid and screen cur-

[*Continued on page 73*]



Bottom view of the 10-meter converter. The r-f coils are wound on one-half inch polystyrene rods.

Receiving Tubes in Your Transmitter

Because the amateur use of certain types of receiving tubes in the r-f stages of low power transmitters represents something less than one percent of the main use of these tubes, their characteristics as printed in the tube handbooks have been the requirements of the larger majority of the users. It is a well known fact that the amateur often is able to exceed these ratings without noticeable ill effects. This question of just how and when, has been recently been investigated by the RCA tube engineers in an effort to determine the maximum ham rating. Their results are tabulated in *Fig. 1*.

These ratings are now the official amateur class C r-f operating maximums and will replace the regular ICAS ratings for these tubes. It will be noted at first glance that the nine tubes in the accompanying table have been given considerably higher input ratings than heretofore. This data has been collected on the basis that the amateur will understand and appreciate that these ratings leave *no margin of safety*, but represent the absolute maximum in power input. In return for this confidence, it is expected that you will accept the revised ratings in good faith and will not attempt stretching them further. It should also be recognized that since these are ham ratings, they are subject to change or modification without notice. There is also some possibility that some of them may even be withdrawn.

The tables indicate no specific condition of operation for these tubes, such as plate modulated or plate and screen modulated amplifier. If, however, such service is contemplated, the plate voltage should be reduced by about 20%. Maintain the stated screen voltage, but adjust the grid drive as if the tube were intended for doubler operation (see notes below).

The efficiency of these tubes naturally drop when used as either a doubler or tripler. The general practice is to calculate the efficiency as the reciprocal of the harmonic relationship, i.e., 50% for the doubler and 33½% for the tripler This drop in efficiency is very significant due to the fact that 50% or 66⅔% less power is being transferred to the load. This wasted power must be dissipated by the tube. Therefore, it is generally necessary to reduce the input to the multiplier stages so as not to exceed the plate and screen dissipation ratings.

Class C amplifier and oscillators may usually be rated as being between 25 to 70% efficient. There is a very pronounced difference between the two types of operation however, in that the oscillator will be providing its own driving power. This means that a large portion of the power input goes into dissipation in the plate, grid-driving power, harmonics, radiation copper and dielectric losses.

Another general rule is to reduce the power input about 20% when operating in the bands higher in frequency than indicated in the accompanying tables.

The grid-plate capacity in the tubes described determine the necessity of neutralization. It is possible to use the 6AG7, 6AK6 and the metal 6F6 without neutralizing, but tube manufacturers cannot strictly control this factor where the capacity is so small. The best bet appears to be neutralization of all tubes when used as 1 to 1 amplifier and be on the safe side.

The most significant part of the tables is the

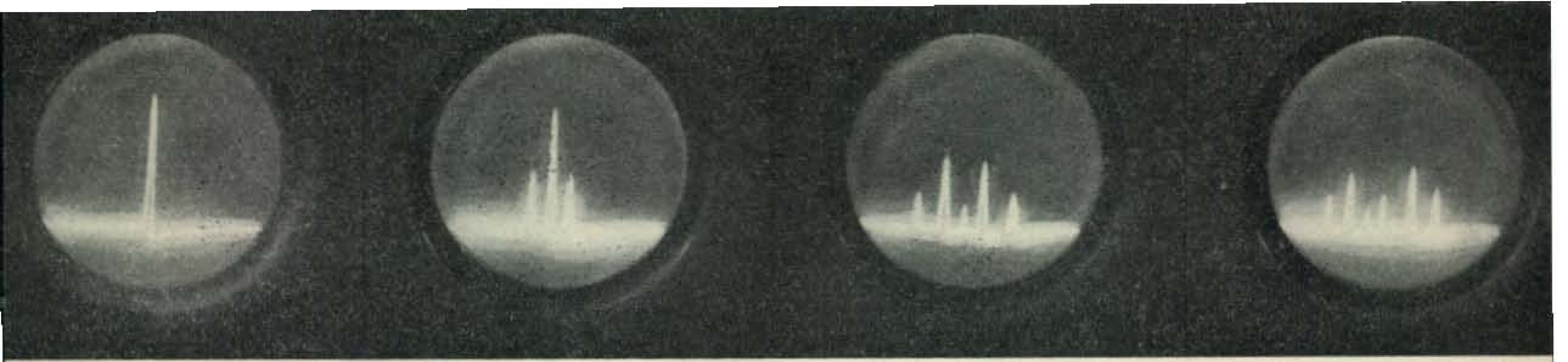
[*Continued on page 76*]

HAM TRANSMITTER RATINGS FOR RECEIVING TUBES (Class C Telegraphy ⁑)

RCA Tubes (Type)	Max. Plate Supply (Volts)	Max. Screen Grid (Volts)	Max. Control Grid (Volts)	Max. Plate (Milliamperes)	Max. Screen Grid (Milliamperes)	Max. Control Grid (Milliamperes) (Note 2)	Max. Plate Dissipation (Watts)	Max. Screen Grid Dissipation (Watts)	Power Output (Watts) (Note 1)	Maximum Frequency (Megacycles)*	Grid Bias Calculator Mu Factor (Approx.)†	Grid to Plate Capacitance (uuf)	Input Capacitance (uuf)	Output Capacitance (uuf)
6AG7	375	250	−75	30	9	5.0	9.0	1.5	7.5	10	22	max. 0.06	13	7.5
6AK6	375	250	−100	15	4	3.0	3.5	1.0	4.0	54	9.5	0.12	3.6	4.2
6AQ5	350	250	−100	47	7	5.0	8.0	2.0	11.0	54	10	0.35	7.6	6.0
6C4	350	—	−100	25	—	8.0	5.0	—	5.5	54	18	1.6	1.8	1.3
6F6	400	275	−100	50	11	5.0	12.5	3.0	14	10	7	0.2	6.5	13
6L6	400	300	−125	100	12	5.0	21	3.5	28	10	8	0.4	10	12
6N7	350	—	−100	30 (per plate)	—	5.0 (per grid)	5.5 (per plate)	—	14.5 (total)	10	35	—	—	—
6V6GT	350	250	• −100	47	7	5.0	8.0	2.0	11.0	10	9	0.7	9.5	7.5
12AU7	350	—	−100	12 (per plate)	—	3.5 (per grid)	2.75 (per plate)	—	6.0 (total)	54	18	1.5	1.6	0.5 (approx.)

Notes (1) Power output based upon plate circuit efficiency of 70%.
(2) 100,000 ohms maximum grid resistor.
* Maximum frequency for full power output and input.

† For pentodes this is the grid-screen amplification factor.
⁑ Maximum ratings are absolute maximum values not to be exceeded under any conditions of operation.



Sideband structure of an FM wave for various deviation ratios, as viewed on the scope of a panoramic adapter. From left to right: (a) unmodulated carrier; (b) deviation ratio of approximately 1, corresponding to amateur NBFM (note reduction in carrier strength); c and d increasingly higher deviation ratios. (Note higher order sidebands).

Laboratory Tests of Weak Signal Narrow-Band FM

OSWALD G. VILLARD, Jr., W6QYT*

Required reading for every radio amateur interested in NBFM

THE PURPOSE of this article is to review the relative advantages, from the standpoint of the amateur, of Narrow-Band FM (NBFM) and conventional AM, and to describe some laboratory tests carried out to determine the relative effectiveness of the two types of modulation as received on a conventional AM receiver when background noise is the limiting factor. The tests point out that when signals are strong and a suitable receiver is available, NBFM offers worthwhile advantages over AM of the same carrier power, whereas when signals are weak and conventional receivers must be used, these advantages disappear and NBFM requires considerably more power than AM for equal communication effectiveness.

Since most amateurs use conventional receivers to receive NBFM, and since in many cases the signals they will be receiving will not be much above the noise level, it is of interest to review the behavior of an ordinary receiver when weak signals are being received.

Receiver Action on Weak Signals

When the signal to be tuned in is fairly weak, the receiver is normally operated at full r-f gain, so that one hears, in the absence of man-made interference, a certain level of random noise caused largely by thermal agitation in the first tuned circuit, shot effect in the first r-f amplifier tube, etc. This random noise may be thought of as being composed of a great number of individual pulses of random lengths, amplitudes, frequencies and phases. These pulses are distributed throughout the frequency band accepted by the receiver. When the envelope of this noise is demodulated by the second detector, an audio output of random noise is of course obtained.

It is interesting to note what happens when an unmodulated carrier is added to the noise voltages present at the second detector of the receiver. We find that as the amplitude of the carrier is increased from zero, the noise voltage output of the receiver increases to twice the value it had in the absence of the carrier. The reason for this increase may be understood with the aid of the diagrams of *Fig. 1*. Let us assume that only a single noise pulse is acting at the input of the receiver, and since this pulse may have any shape whatever, we will assign it one. . . . we will make it a square pulse of sinusoidal radio signal whose frequency differs from that of the carrier by—let us say—1000 cycles. When this synthetic noise pulse is demodulated by itself, an audio pulse is formed whose peak amplitude is one-half the peak-to-peak voltage of the radio-frequency pulse. But now when the carrier is introduced, the vector sum as a function of time, or envelope, of the carrier and the noise pulse is shown in *Fig. 1*. The action, so far as the detector is concerned, is much as if the noise pulse had amplitude-modulated the carrier. The peak-to-peak amplitude of the output pulse when detected as a "modulation" on the carrier, is now *twice* the peak amplitude of the output pulse generated when the original noise wave-form is detected alone. These considerations are quite general, and apply

*Dept. of Electrical Engineering, Stanford University, Calif.

no matter what the waveform of the noise impulse; in this fashion, the noise voltage output of a radio receiver is doubled by the presence of an unmodulated carrier, provided the carrier is not so strong that overloading or automatic-volume-control action occurs.

This effect is familiar to anyone who has operated a sensitive radio receiver; for example, it is often possible to tell when a faint carrier goes on and off the air by the change in background noise level, even when the carrier is so weak that voice modulation on it cannot be copied. The increase in receiver noise when the beat frequency oscillator is switched on is another example of the same phenomenon.

Now suppose the incoming carrier is several times stronger than the receiver noise. The resulting envelope will look like that of *Fig. 2A*. The percentage of noise "modulation" of the carrier is small, and we can pass the resultant wave through a clipper which removes the "noisy" top and bottom, leaving the clean envelope of *Fig. 2B*. The clipping process has not affected the frequency of the wave, so it is still possible to transmit intelligence by FM or PM; however, if we put the wave of *Fig. 2B* through a frequency-sensitive detector, we find that there is still some noise coming through: in other words, the noise in the set has in effect "modulated" the frequency or phase of the wave as well as its amplitude.

A vector diagram will help make this clear. This time we will simplify our noise pulse still further, and let it be represented by a simple sine wave weaker than the carrier, and of random phase with respect to it. The dotted straight lines of *Fig. 3* show some of the possible resultants which could be formed depending on the relative phase between our "noise" and the carrier. It is seen that the resultant of the carrier and the "noise" voltage is a vector modulated in both amplitude and phase. If the resultant is clipped at the level shown, a wave modulated in phase but hardly any in amplitude, is the result. Noise will, of course, be heard when the clipped wave is demodulated by an FM or PM detector.

Noise Voltages

It is very important to note that the noise voltages produce only *phase* modulation of the carrier. The maximum phase excursion of the resultant vector in *Fig. 3* is dependent only on the magnitude of the noise voltage and not on its frequency with respect to the carrier. This distinction is important, because in frequency modulation the desired signal is modulating the *frequency* of the carrier, whereas the uniformly distributed noise produces what is essentially a phase modulation of the carrier. Now when a wave phase-modulated by noise voltages of all frequencies is demodulated by an FM detector, it will be found that the individual noise pulses whose frequencies are close to the carrier do not frequency modulate the carrier very much, and hence produce little audio output. (*Any* low frequency phase modulation on the carrier would not produce much audio output.) However, within limits, the greater the separation between the frequency of the individual noise voltages and the carrier frequency, the greater the demodulated output they will produce. *Fig. 4* shows a curve of the noise voltage output of an FM receiver as a function of the audio frequency. This is what makes the background noise of an FM receiver sound so high-pitched and hissy. The equivalent curve for an AM receiver is horizontal.

So long as the desired signal is strong enough in relation to the noise to permit clipping off the amplitude modulation of the resulting envelope, only that noise due to incidental phase modulation of the carrier will be heard in the output of

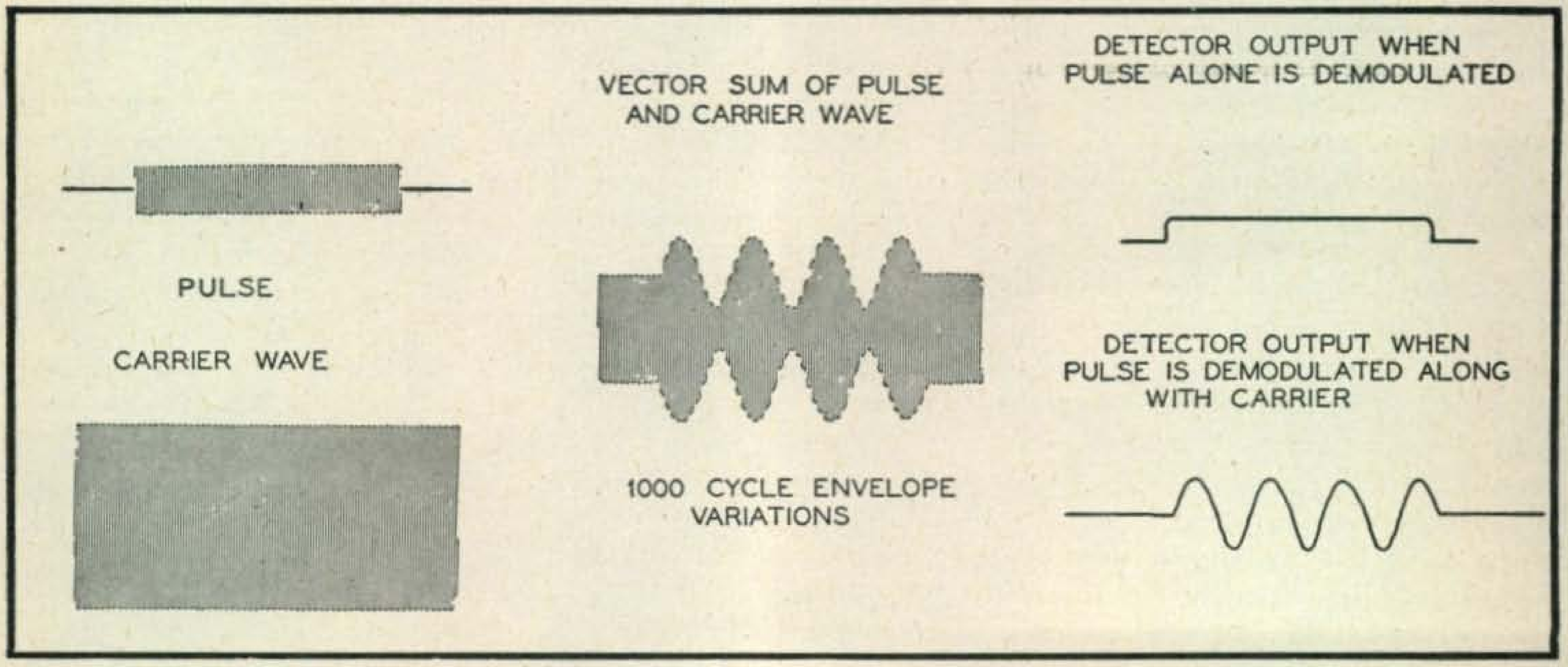
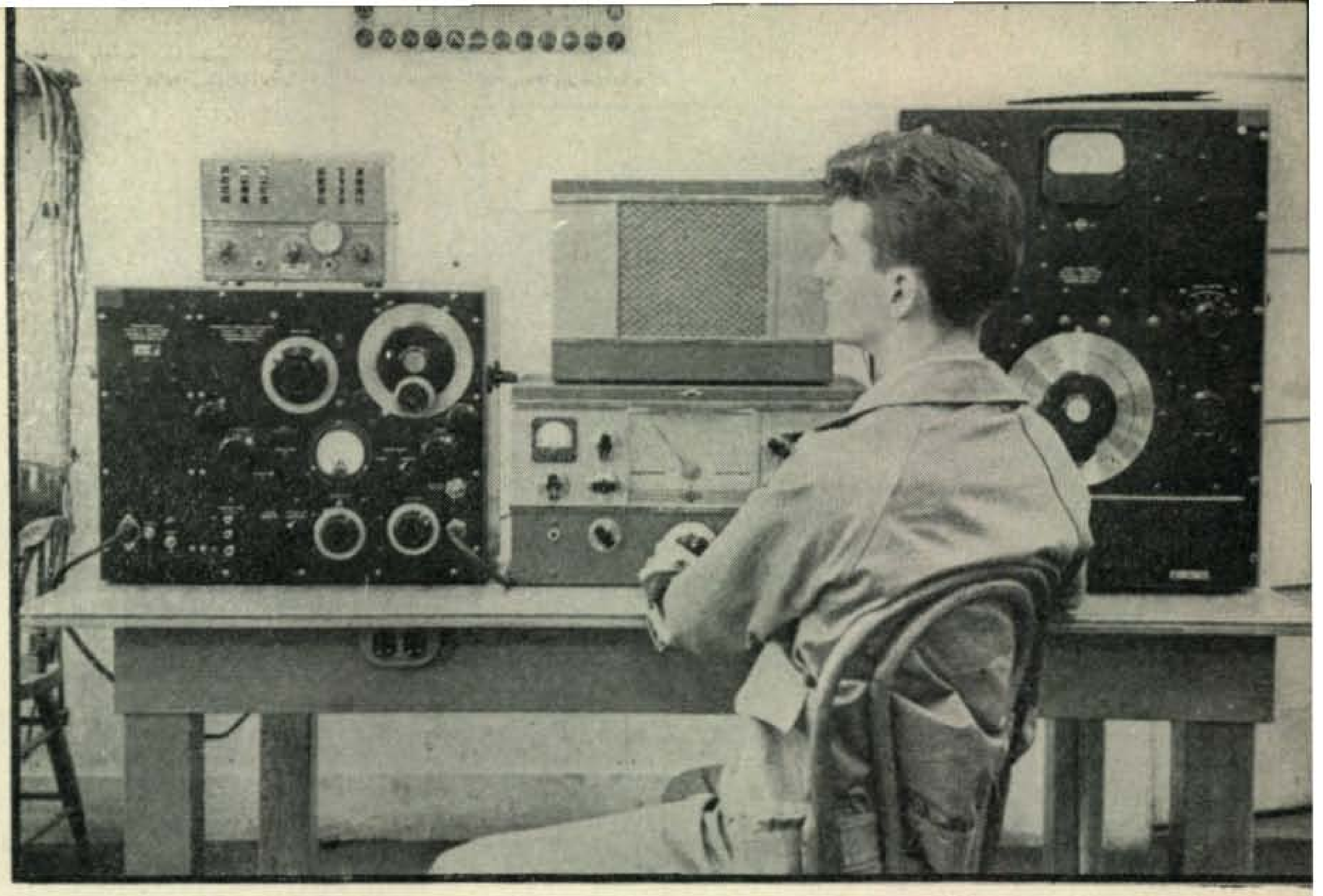


Fig. 1. Graphic illustration why presence of carrier increases detector output voltage (see text).



Lester A. Roberts of Stanford Radio Club demonstrates laboratory set-up for studying signal-to-noise ratio of NBFM and AM. Signal generator at left, wave analyzer at right.

the set, and the distribution of this noise over the audio frequency band will be that of *Fig. 4*. Now the desired frequency modulation on the carrier will, of course, produce an output which is independent of audio frequency; that is, the detector will develop the same output voltage whether the frequency of the modulating voltage is 100 or 10,000 cycles. Consequently, the signal-to-noise ratio for low modulating frequencies will be extremely good. This ratio will drop off linearly as the frequency of the modulating voltage is increased.

It is easy to see that when the carrier is strong enough and good clipping occurs, the output signal-to-noise ratio depends primarily on the extent of the frequency swing of the carrier imparted by the modulating voltage. The wider the swing, the greater the audio output for a given amount of noise. This is not quite correct, of course, because as the swing is increased the bandwidth must be increased and the wider the band, the more noise is picked up. However, the noise picked up increases as the square root of the bandwidth while the desired audio output is directly proportional to the swing, so that as long as the signal is strong enough, there is improvement to be derived from increasing the swing. The improvement in S/N power ratio at the output of a radio receiver to be derived from FM over an AM system of the same carrier power can be calculated, and is found to be equal to $3D^2$, where D is the deviation ratio, or the ratio of the variation of the carrier frequency from the mean value to the modulating frequency. In the case of narrow-band FM, where D is equal to one, for a given S/N ratio in the receiver, we would expect to be able to transmit with one-third less power than with AM. This means that a 333-watt FM signal would be able to give the same S/N ratio at the receiver as a 1-kilowatt AM signal.

This advantage looks pretty inviting and for certain kinds of work, it is. FM, as is well known, is capable of suppressing interference from other stations on the same channel. It does this in the same way in which it rejects noise—that is, the interfering carrier in combination with the desired carrier causes undesired amplitude and phase modulation of the resulting envelope. If the undesired signal is not too strong, the spurious AM is clipped off, and the spurious PM attenuated because the receiver responds primarily to FM. The suppression of interfering stations, like the suppression of noise, is only good where the deviation ratio is large—preferably much larger than one. With the narrow-band FM system, this occurs only at the lower audio frequencies.

Now it would be very nice if we could be sure of strong signals all the time, but in amateur work there are a great many occasions when the signal we are trying to copy drops down into the background noise or general QRM level. Consequently, it is worthwhile to consider what happens in the case of NBFM when the desired signal is of the same order of magnitude as the receiver thermal noise. Under these circumstances, of course, clipping does not help very much as shown in *Fig. 5*. The output of an FM receiver will then contain the contributions of both AM and PM noise "modulation" of the desired carrier. Consequently where the S/N ratio is approximately one, we can for all practical purposes forget about the clipper or limiter circuit and consider the behavior of the receiver in terms of the discriminator.

Under these conditions, there is little distinction between a receiver for AM and one for FM, when the AM and FM signals to be received have

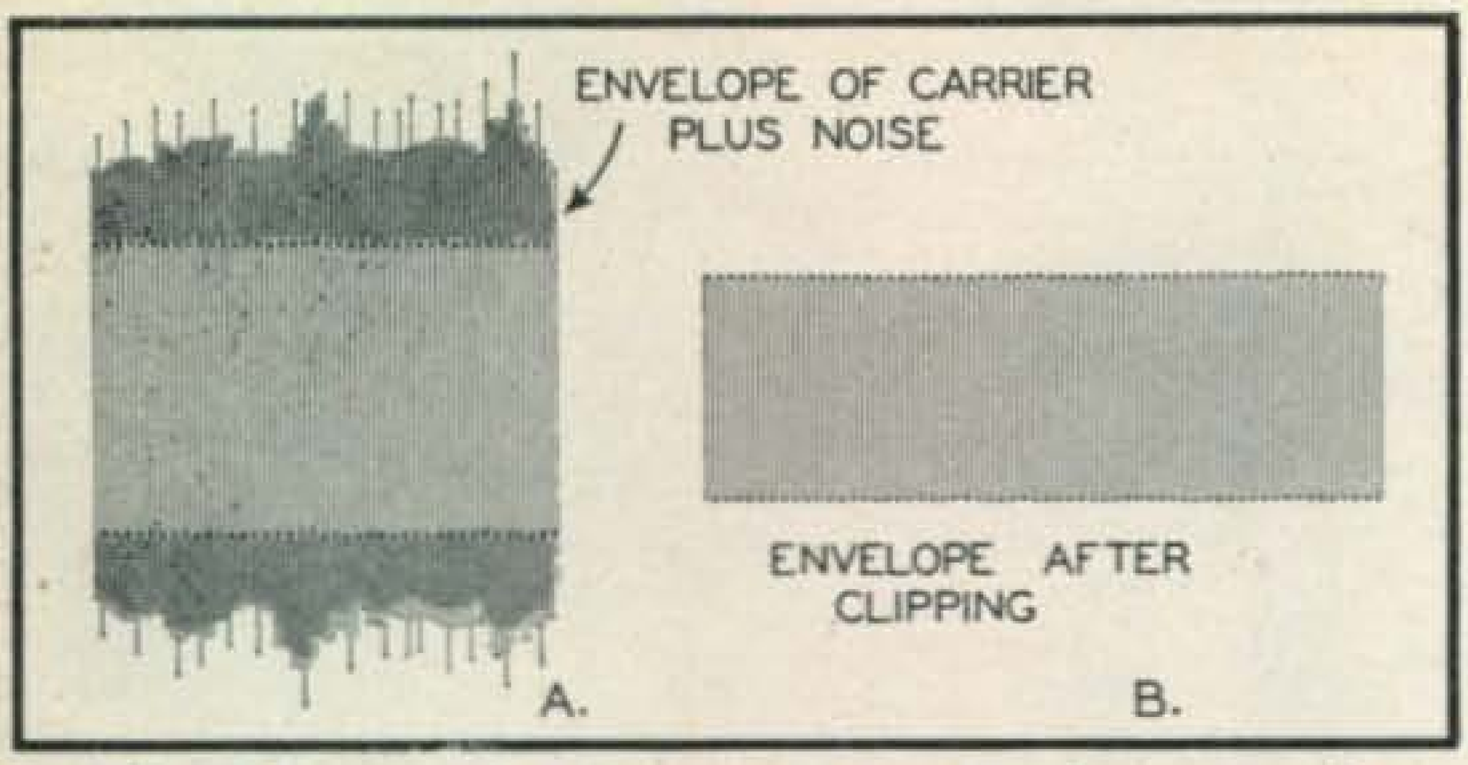


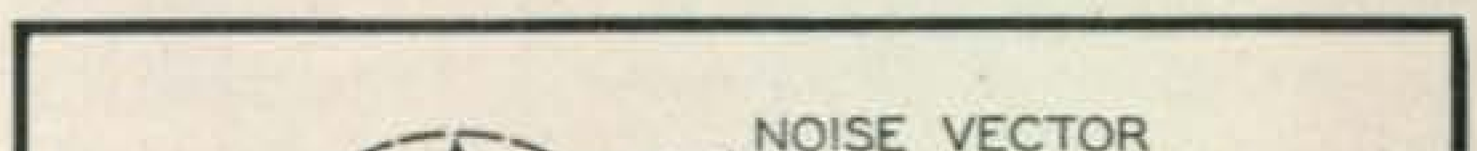
Fig. 2. Carrier plus circuit noise produce envelope having noise AM which may be removed by clipping top and bottom of composite signal. In FM or PM systems the modulation intelligence is not destroyed.

the same bandwidth. The receiver for FM must have a detector circuit sensitive to changes in frequency—but by detuning the AM receiver we have just that. By using the sloping sides of the selectivity curve in an AM receiver, we may not have a discriminator characteristic which is perfectly linear, but it is sufficiently so for practical purposes. To receive AM, then, we tune the signal to the center of the passband, as in *Fig. 5*. Its amplitude will then be varied between zero and twice the carrier value during the modulation cycles for 100% modulation. The FM signal, on the other hand, has an amplitude which stays constant during the modulation cycle. It must be so tuned in that when no modulation is applied, the second detector of the receiver is delivering one-half the output voltage which would be delivered if the carrier were on tune. Then the frequency swing and the sharpness of the receiver selectivity curve must be so related that the carrier frequency is just swung to the peak of the selectivity curve by the positive peak of modulating voltage. (A more rigorous way to analyze the situation would be to consider the sidebands of the FM wave and see how their amplitudes and relative phases are affected by a detuned resonant circuit; it would then be found that the FM sidebands are shifted in amplitude and phase in such a way that their resultant would be AM. However, the other way of looking at it gives the same answer and is easier to visualize.)

From the foregoing it can be seen that in effect the real function of the discriminator in an FM receiver is to convert FM into AM so that it can be detected in the conventional way. It follows, when a conventional receiver is used, that one-half of the maximum available amplitude of the incoming FM carrier must be thrown away in order to make possible 100% modulation of the detected AM. This apparent "waste" of three-quarters of the power in the FM carrier wave is of no concern when that wave is strong compared to any noise which may be present, nor is it then essential that the detected AM be modulated 100%, since any deficiency in detector output can be made up by increased audio gain. But when the FM signal to be received drops down into the noise level, the loss in effective carrier power cannot be ignored, and the matching of frequency deviation to receiver selectivity becomes extremely important. For it is good old amplitude modulation that is detected in the end, whether that AM be caused by a proper AM signal, or by a wobbling FM carrier. If the signal being received produces one volt at the second detector when tuned to the center of the receiver passband, its strength at the peak of the modulation cycle will be 1 volt in the case of FM, but 2 volts in the case of AM, assuming the correct tuning in each case. Moreover, the 1 volt for FM will be produced only if the deviation and the receiver selectivity curves are properly matched. If they are *not* matched, the AM signal produced by the FM will be modulated under 100%; the audio voltage to override the background noise will be even less, and the S/N ratio will suffer accordingly.

Laboratory Tests

In order to study the audio noise output of a typical communications receiver both when a weak carrier is tuned in exactly, and when the same carrier is detuned slightly as would be the case for NBFM reception, the following experiments were carried out, using an NC 200 receiver tuned to the 10-meter band and operated with the r-f gain control on full. The total noise output of this receiver under various conditions was measured by means of a vacuum tube voltmeter, and the spectrum of the receiver noise, that is, noise output as a function of frequency, was investigated by means of a General Radio wave analyzer. The results are shown in *Fig. 6*. The changed frequency distribution of the receiver output noise when the receiver is tuned away from an unmodulated carrier, is clearly indicated. Note that the curves have been corrected to start from the same value at 100 cycles, in order to



Random noise in FM may be represented by a noise vector which rotates around the carrier vector at a frequency equal to the difference of the desired carrier and the undesired frequency. This produces AM and some PM. The AM may be removed or clipped by limiting the carrier level at the receiver. The resultant is still phase modulated by the noise, and is detected by an FM receiver.

make their shapes clearer. The *total* output voltage is of course 6 db greater under the conditions of curve 2 than under the conditions of curve 1. It was found that this total voltage was approximately the same for curves 2, 3 and 4. For the conditions of curve 5, the total voltage was approximately 3 db greater than the level of the set noise. For the conditions of curve 3 the total noise output voltage was perhaps 1-2 db greater than for the conditions of curve 2, but the difference was not great enough to be considered significant.

These tests showed quite clearly that the total noise voltage output of the receiver remains approximately the same when the carrier is detuned slightly to one side of the center of the receiver resonance curve. *This means that the audio output resulting from NBFM of the incoming carrier has to compete with the same total noise voltage as does the audio output resulting from AM when the carrier is located in the center of the receiver passband.* The tests also showed that the frequency spectrum of the noise is changed when the carrier is detuned to one side of the peak of the resonance curve, as would immediately be suspected on the basis of listening tests, since the noise from the detuned carrier sounds higher-pitched and sharper. Since the direction of this shift of the spectrum is such as to cause the noise to peak at a frequency in the upper audio range, it is to be expected that the masking effect on speech of this peaked noise will be greater, for a given total RMS noise output, than that of noise with a flat frequency spectrum.

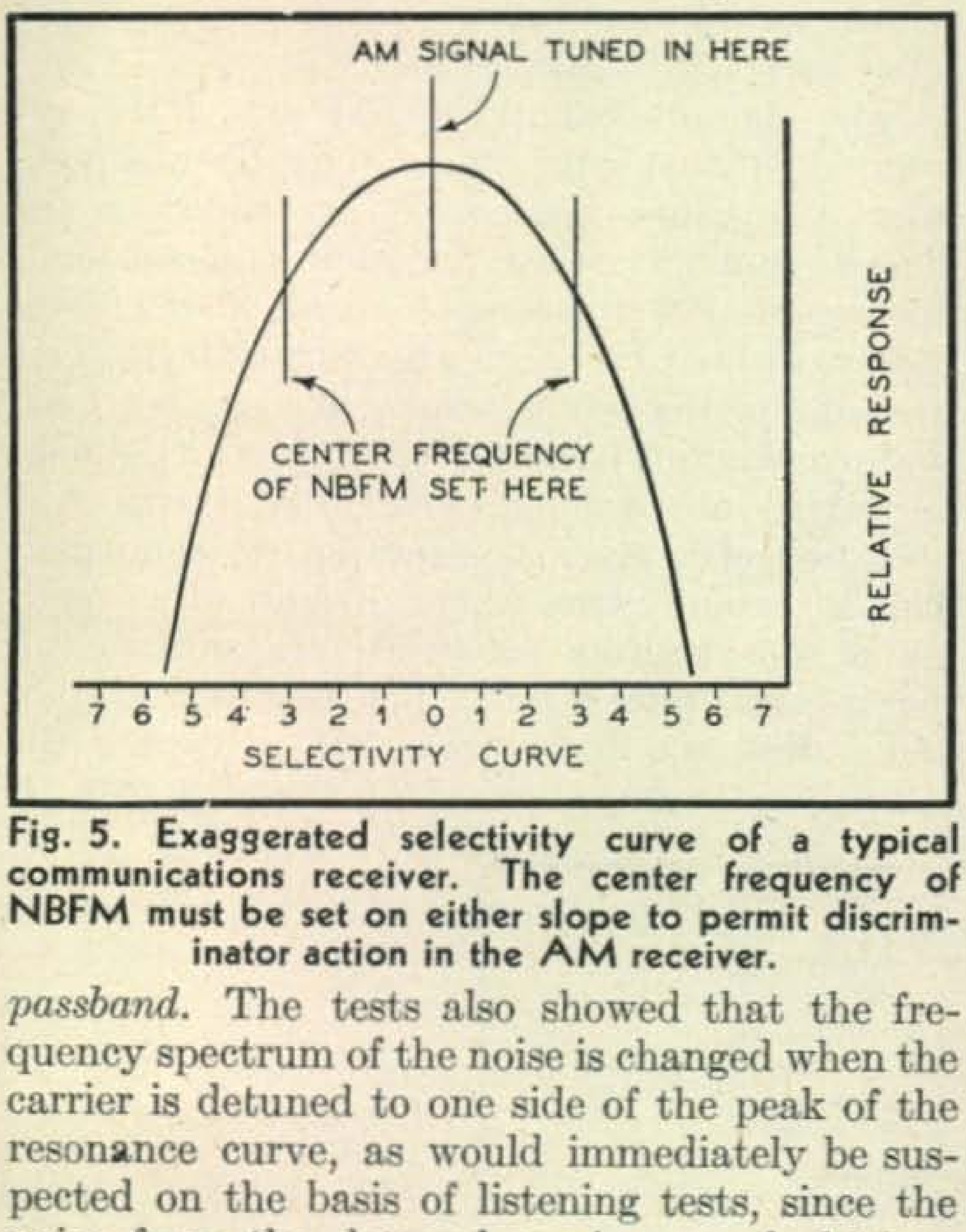


Fig. 5. Exaggerated selectivity curve of a typical communications receiver. The center frequency of NBFM must be set on either slope to permit discriminator action in the AM receiver.

That the total noise output of the receiver should remain roughly constant for reasonable amounts of detuning, is perhaps a somewhat unexpected result; however there would seem to be a reasonable explanation. We recall that the noise voltages reaching the receiver second detector in effect both phase and amplitude-modulate the incoming carrier. When that carrier is tuned to the center of the receiver passband, incidental PM caused by the noise voltages is not demodulated efficiently because the carrier frequency is being deviated back and forth across the relatively flat top of the resonance curve. Incidental AM of the carrier is, of course, demodulated quite efficiently. But as the carrier is detuned to one side of the receiver passband, the efficiency of demodulation of the incidental PM is greatly improved because of the steepness of the sides of the resonance curve; the discriminator action is, in short, much more efficient. At the same time the amplitude of the received carrier is being reduced, and consequently that component of the output due to noise AM of the carrier is weaker. Therefore the total noise (due to all causes) produced by the presence of the carrier, stays roughly the same. At the center of the passband, then, one has a strong carrier, efficiently detected noise due to AM of the carrier, and inefficiently detected noise due to PM of the carrier. As the carrier is shifted away from the center, we have a weaker carrier, but efficiently detected noise due to both PM and AM of the carrier. The increase in the efficiency of detection of the PM component of the carrier noise at first balances the over-all reduction in noise caused by the weakening of the carrier due to detuning. Eventually, of course, the total noise decreases as the carrier is still further weakened after the efficiency of detection of the PM noise has reached its peak.

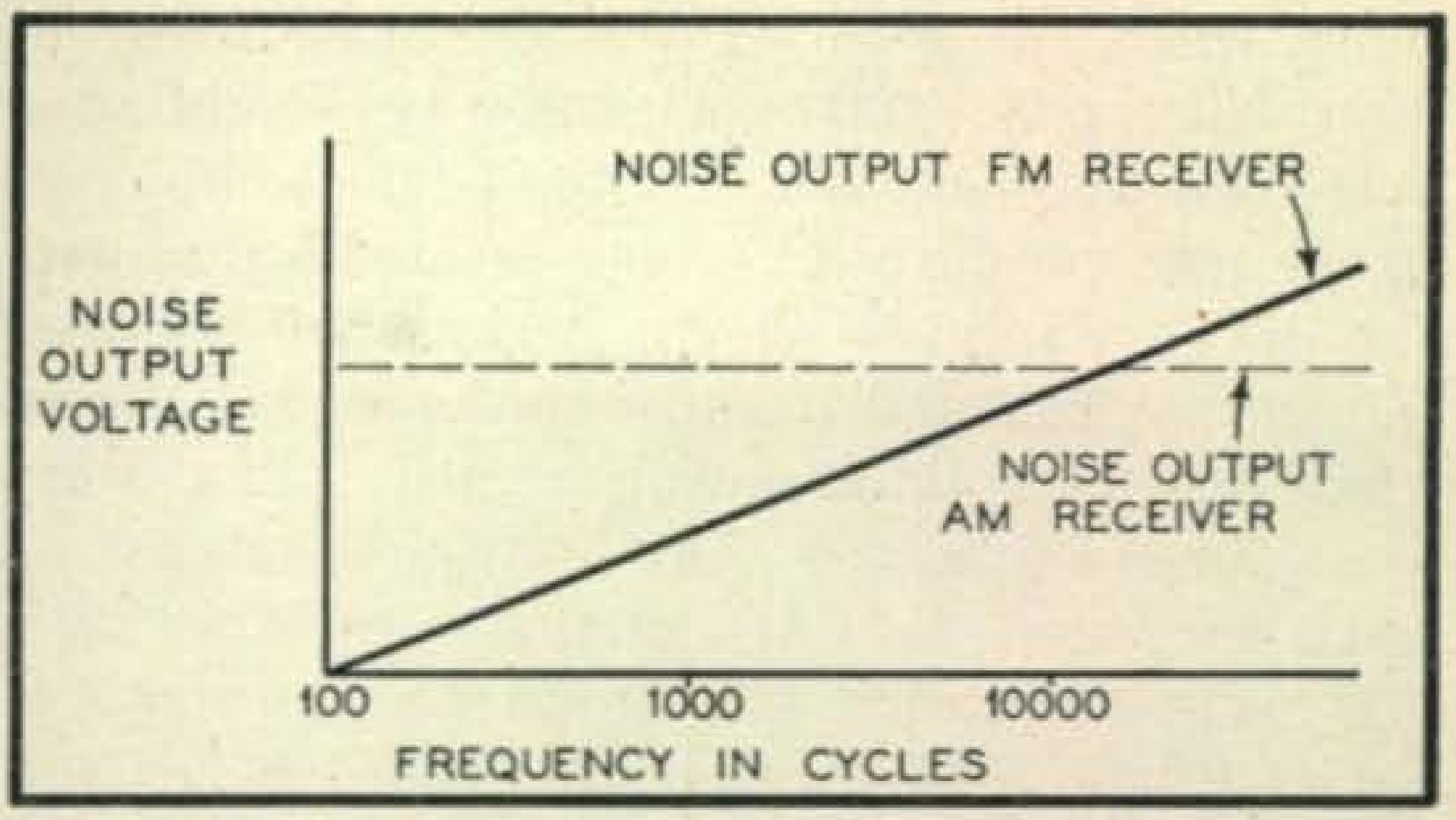


Fig. 4. Noise frequencies close to the FM carrier produce little frequency modulation noise but as the speed of the rotating noise vector in Fig. 3 increases so does the noise at higher audio frequencies. The comparative noise output of the two types of receivers is shown above. In commercial practice a high frequency de-emphasis circuit follows the discriminator.

Detector Output Losses

In order to verify the theoretically-expected 50% loss in carrier voltage when narrow-band FM is used instead of AM, a further experiment was performed with the NC 200 receiver and the G-R wave analyzer. A 10-meter signal from a commercially-available amateur narrow-band frequency modulator was attenuated and fed into the receiver with a strength such that the unmodulated signal just barely doubled the receiver noise when the receiver was operated with the gain wide open. 400-cycle sine-wave modulation was then applied, and the 400-cycle component of the receiver output voltage was measured with the wave analyzer which, because of its high selectivity, rejected most of the noise and measured only the modulating signal. The wave analyzer reading was then compared with that obtained when the FM signal was replaced by a 400 cycle-modulated AM signal of equal strength derived from a General Radio signal generator. It was found that with very careful adjustment of the receiver, the 400-cycle modulation voltage measured by the wave analyzer in the case of FM, was just about 6-db less than that obtained when the AM signal was substituted. If anything, this test was flattering to the narrow-band FM, for the General Radio AM signal generator was not modulated more than 60% because higher values gave excessive incidental frequency modulation. However, it is possible that the frequency deviation of the narrow-band frequency modulator was not perfectly matched to the receiver bandwidth, although care was taken in making this setting and all indications were that the match was good. The two sources of error, therefore, may to some extent have balanced each other.

Field Tests

It should be noted that this test did not take into account the masking effect on the ear of the changed noise distribution when the receiver is detuned for narrow-band FM reception, since the wave analyzer virtually eliminated all but the 400 cycle modulation output of the receiver. In order to check the effect of the changed noise spectrum, and to make an NBFM-AM test using voice signals under actual operating conditions, the NC 200 was taken to a location about a mile away from the Stanford Radio Club's W6YX, and operated from a short antenna so that the signal picked up was of roughly the same strength as in the laboratory tests. At W6YX, the narrow-band FM exciter was connected in place of the crystal in the Club's 11-meter AM transmitter. The same microphone was plugged first into the FM exciter, and then into the AM modulator. A number of tests were made to determine the carrier power ratio required to transmit speech signals of equal sentence intelligibility by AM and NBFM, and it was found that this ratio was roughly 10 db for signals of equal intelligibility using either method of communication. That is to say, 70 watts, amplitude modulated, gave a signal as readable as a 700-watt NBFM signal. The tests were made at night, on the 11-meter band, when QRM was absent and receiver noise the limiting factor. Discouraging as these tests were, the results were nevertheless consistent with expectations based on theory and the laboratory tests described above.

Now the proponents of FM and PM have pointed out that if the modulator tubes of a high-level AM phone transmitter are added to the class C amplifier when the same transmitter is operated on FM, it is possible to double the power output without exceeding the tube ratings. This doubling of the power results in a proportional improvement in circuit performance which should be taken into account when FM versus AM operation of a given transmitter are compared. This is certainly true where the cost of power is not a consideration (since the transmitter will require more total power input for FM operation under these conditions than AM) or where the

[*Continued on page 71*]

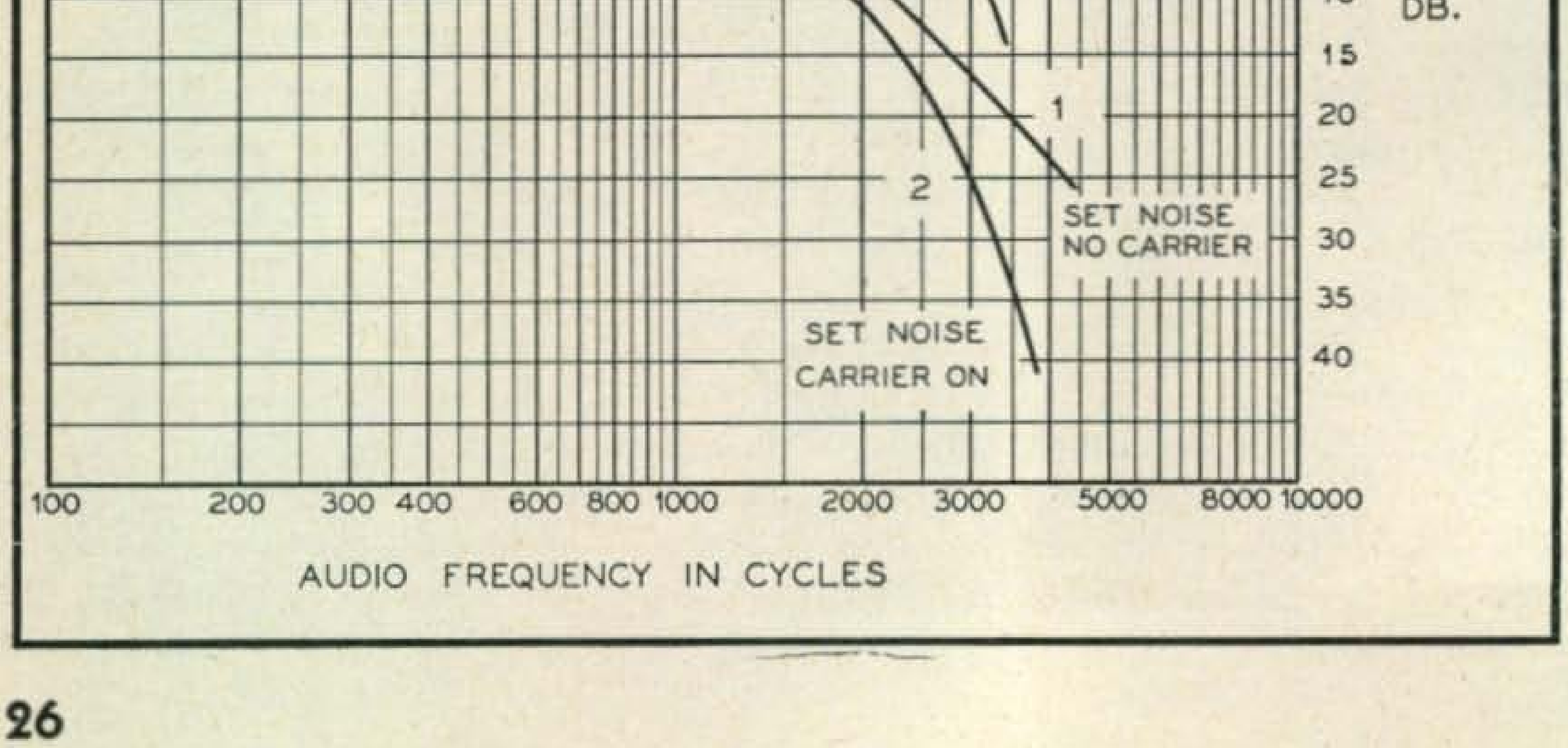
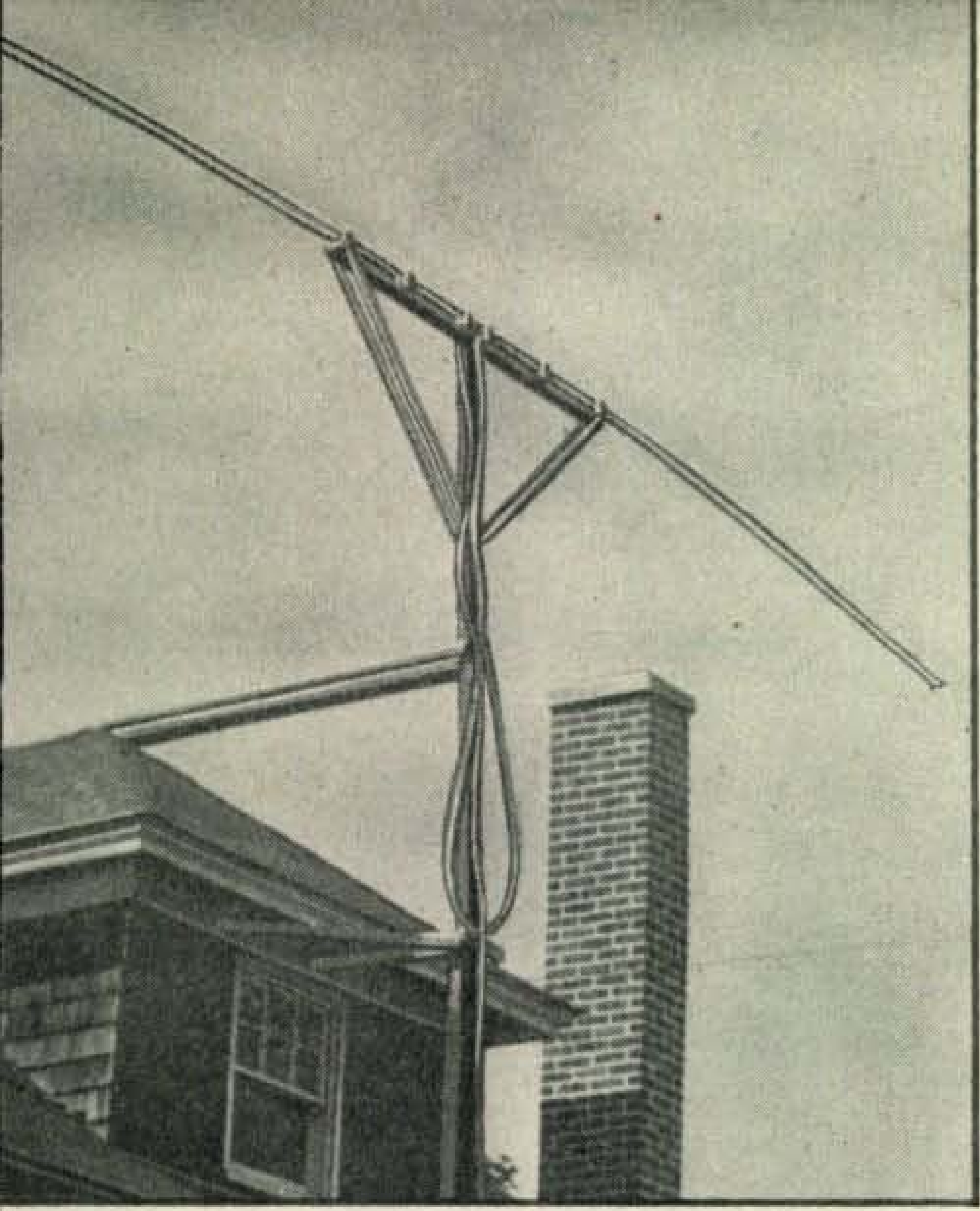


Fig. 6. Frequency distribution of the NC-200 receiver background noise when detuned from a 5 microvolt unmodulated carrier. These measurements were made with the r-f gain at maximum and the a-v-c off. Curve 2, set noise carrier, was measured with the receiver in tune.



The Trombone T

HENRY M. BACH, Jr. W2GWE*

The engineering design behind the simple, but very effective Trombone T was covered in March CQ. Completing the series, the author discusses several other design features and gives details of actual antenna construction

Clearly visible in the photograph of the complete Trombone T, is the folded dipole constructed of Premax antenna elements and also the quarter-wave trombone matching section.

THE LENGTH OF THE BAZOOKA or quarter-wave transformers should *not* be shortened by the V.P. of the cable, since the out-of-phase currents are carried by the *outer* conductors of the transmission line and the bazooka. The dielectric comprises the two thicknesses of vinylite outer coverings, and the air between the bazooka and the transmission line. Since the spacing between the quarter-wave transformer and the feed line will be much greater than the thickness of the vinylite and thus the dielectric is mainly air, the transformer length should be a quarter-wave times .95. A preferred method of installation would be to remove the vinylite sheath (vinylite is a rather poor electrical insulation), and to space the line approximately 1″. In fact for this type of quarter-wave transformer, coax is no better than standard tubing having the same O. D. as the outside diameter of the outer conductor of the coax used for the transmission line.

While on the subject of the quarter-wave transformer, much better results will be obtained if it is made of tubing larger than the coax, with the coax placed inside the tubing, used as a sheath. The vinylite should be removed from the coax for a distance of a quarterwave and annular rings of insulation used as spacers to center the coax concentrically within the tubing. No connection need be made between the tubing and the coax at the antenna, and at the other end of the quarter-wave tubing, the tubing is connected to the outer conductor of the coax. (See *Fig. 7*). If the diameter of the quarter-wave shield is much larger than the diameter of the coax, the vinylite may be left on the coax.

It is important to point out that coax is actually a *three-wire line*. The transmission or feed-line currents flow on the outside of the inner conductor and the inside of the outer conductor. Antenna currents flow on the outside of the outer conductor. The above shorted quarter-wave stub prevents the antenna currents from developing on the outside of the outer conductor of the coax.

In the case of the twin-conductor cable used as a folded dipole radiator, the out-of-phase currents are between the two quarter-wave sections, and the amount of polyethylene dielectric is manifestly negligible with respect to the air dielectric between corresponding portions of the sections. The polyethylene dielectric between the two *conductors* of each section is of no effect save that it acts as an insulator, since the currents in the two conductors of each section are in phase.

Our digression on coax was intentional, since as will be seen, we are going to feed our folded dipole with coax. Properly matched, coax is capable of transmitting efficiently the power from the final tank circuit to the antenna. The loss in present-day coax is negligible, it may be run anywhere, it will not radiate (provided the coax is detuned so the outside conductor cannot carry antenna currents; it will not radiate feeder current), it presents no hazard since the outside is "cold," and it is not affected by humidity.

However, a coax feeder is unbalanced with respect to ground since the outer conductor has a larger capacity to ground. This unbalance is not important when feeding a quarter-wave vertical or other types where it is desirable to have the generator appear between the base or feed point and ground as shown in (*a*) of *Fig. 8*. However, in a half-wave horizontal, *Fig. 8* (*b*), the capacity to ground of both sections is equal, and the feed line should be balanced with respect to ground to preserve the symmetry. *Fig. 8* (*c*) shows the de-

**36 Woodmere Blvd. S., Woodmere, N. Y.*

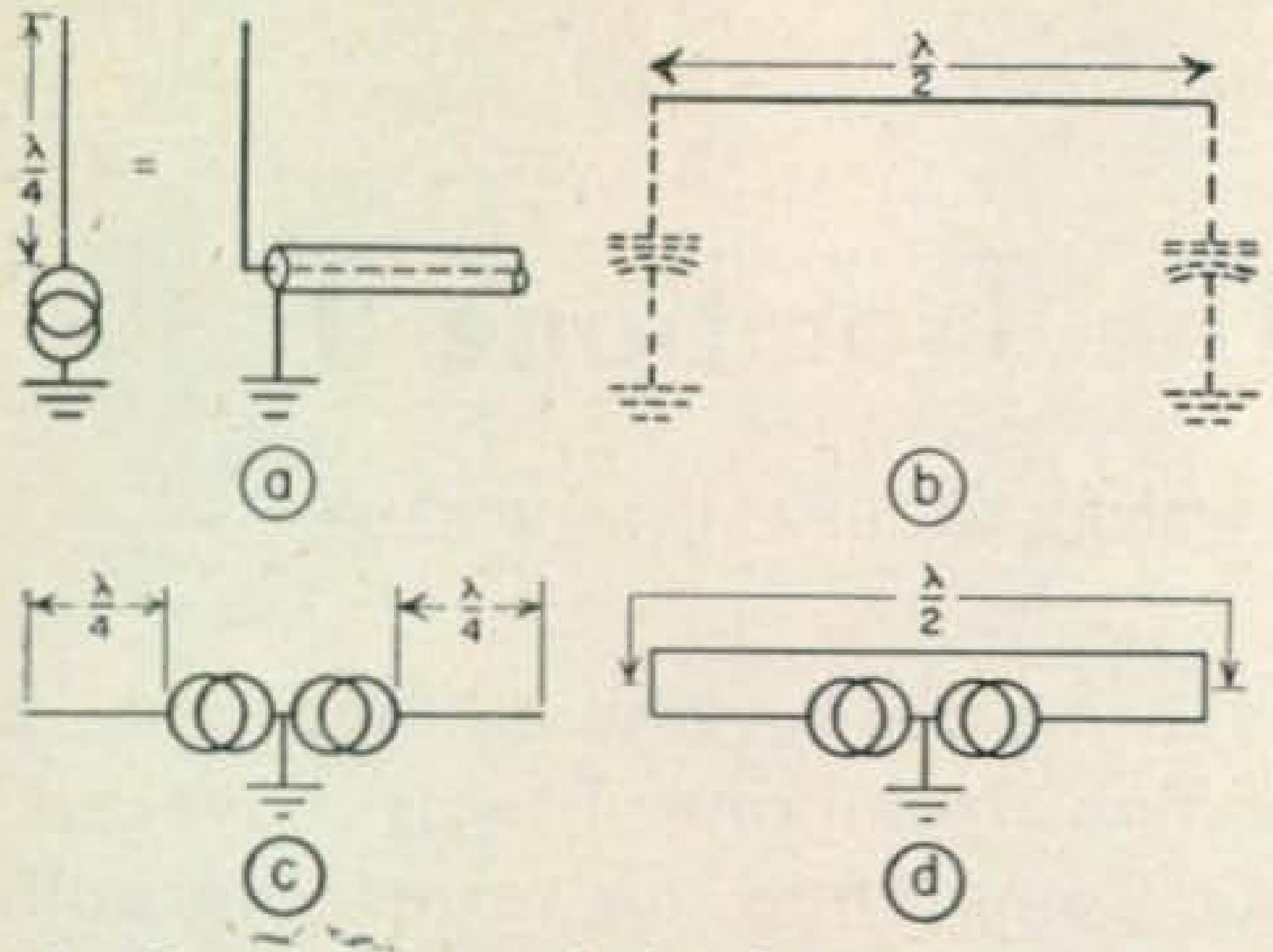


Fig. 8. Development of the balanced feed system required for any folded dipole (see text).

sirable symmetrical feed for the center-fed antenna. The folded dipole requires the same balanced feed system as shown in *Fig. 8 (d)*. The input into which the feed line looks, in the case of the center-fed, half-wave dipole, is shown in *Fig. 9 (a)*, and for the folded dipole, in *Fig. 9 (b)*. In *Figs. 9 (c)* and *(d)*, the symmetrical resistances with respect to ground are shown, and the points A and B must be excited 180° out of phase.

Coax cable is supplied in surge impedances of approximately 52 ohms and 73 ohms. Whereas impedances as high as 125 ohms may be obtained, the coax cable is expensive and the attenuation is higher due to the substantial departure from the optimum ratio between conductor diameters. Further, for a given O. D., the power-handling capacity is reduced because the center conductor diameter is less for a given O. D. in higher impedance coax, and can dissipate less heat.

If we were to feed our folded dipole with standard 73-ohm cable we see that a bad mismatch would occur, and further, the balanced feed between A and B and the ground or datum point would not be realized.

The writer was confronted with the following problem: A folded dipole radiator was desired to provide entire band operation and a coax feeder was wanted for the reasons outlined above. Yet the feed impedance of the folded dipole was 292 ohms symmetrical with respect to ground and the impedance of the coax feeder was 73 ohms, non-symmetrical with respect to ground. We have named our solution to the problem, "The Trombone T."

Referring to *Fig. 9 (b)*, it will be noted that the impedance between A and B is equal to 292 ohms which in *Fig. 9 (d)* is shown to be equal to an impedance of 146 ohms between A and ground and an impedance of 146 ohms between B and ground. Points A and B must be fed 180° out of phase. If we were able to parallel points A and B we would have an impedance of 73 ohms between the junction of A and B and ground, one side of this impedance being grounded. This would be perfect for the coax feeder. However, A and B cannot be directly paralleled, since it would be impossible to effect the phase reversal between A and B.

Consider now a half-wave transmission line used as a transformer. The half-wave transmission line effects the transformation $Z_{in}=Z_{out}$ and the phase is shifted 180°. Hence, if we were to connect the points A and B together through a half-wave transmission line, we would effectively parallel the points A and B, yet would feed A and B 180° out of phase. Refer to *Fig. 10*, in which we show this junction. Now we can feed the antenna between A and ground, or between

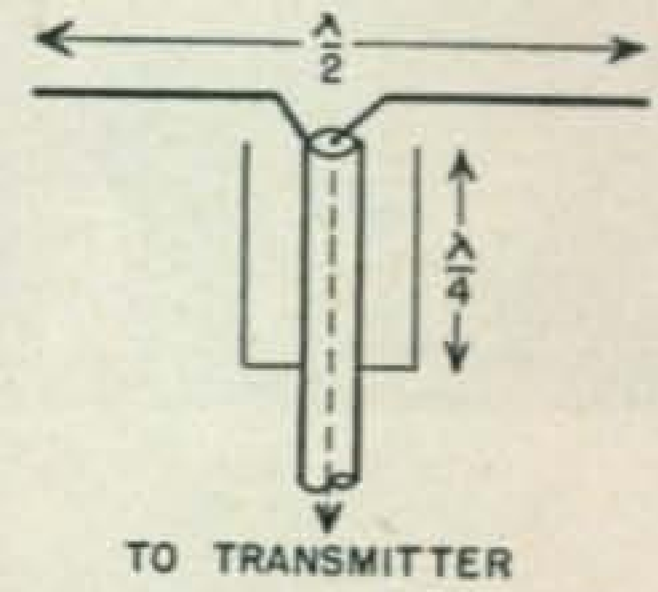


Fig. 7. Recommended method of constructing quarter-wave detuning sleeve.

B and ground, and the impedance looking in at the feed point will be 73 ohms. Just as in *Fig. 9 (d)* it was shown that the ground was the electrical midpoint between A and B, the same applies to the other antenna element of the folded dipole. *Fig. 11* shows the entire arrangement of the "Trombone T." The center of the unbroken element is connected to the outer conductor of all three concentric terminations, and by grounding the outer conductor of the feed line at a convenient point the entire system is grounded and protected from lightning at all times.

From our previous discussion, the electrical length of the half-wave coax transformer is the physical length times the V. P. of the cable. From measurements made by the author, a value of V.P. = .66 for the polyethylene concentric cable, made by Federal Tel. and Radio Co., has been found to be correct. In the case of any coax, the V.P. may be calculated from the relationship $V.P. = \frac{1}{\sqrt{k}}$, where k is the dielectric constant of the dielectric. ($k=2.3$ for polyethylene made by F. T. and R.) Cutting the half-wave coax transformer according to the following formula

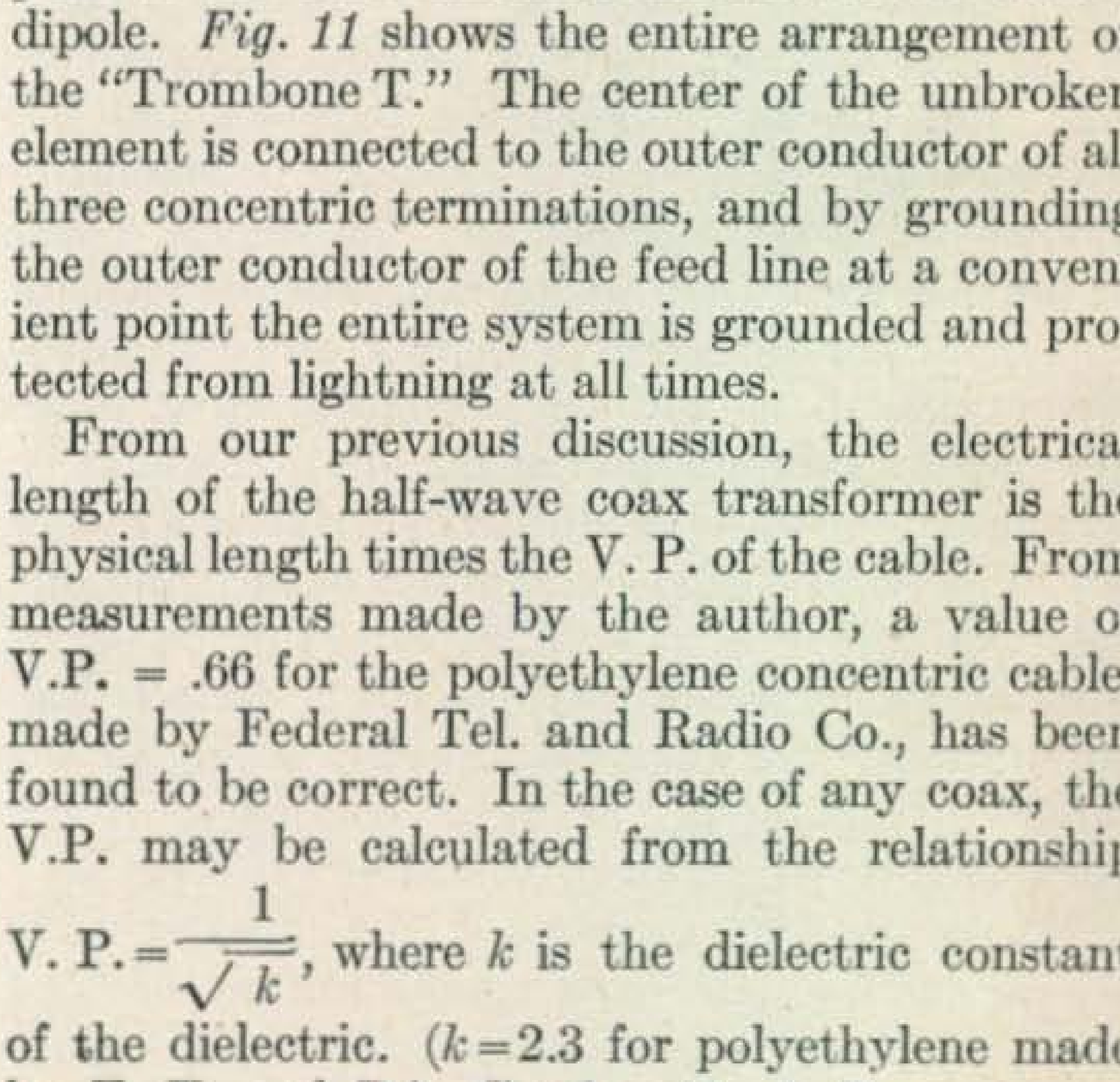


Fig 9. Impedance into which the feed line looks in the case of (a) center-fed half-wave dipole, (b) folded dipole. Symmetrical resistance with respect to ground are shown in c and d. End points must be excited 180° out of phase.

will be found entirely accurate: Length of half-wave transformer $= \frac{492}{f \text{ (mc)}}[.66] = \frac{324.7}{f \text{ (mc)}}$

If you wish to check your results resonate a stage in your transmitter to the desired operating frequency by tuning for minimum plate current. Connect the inner conductor of the half-wave transformer to the hot side of the tank coil, the outer conductor to ground. Leave the other end of the transformer open (*be careful*—this open end will be "hot"). Then check that the addition of the half-wave transformer has not changed the tuning. If you have to close or open the tank condenser to effect resonance (minimum plate current), the half-wave transformer is too short or too long and it can be pruned to the correct length by altering the length of the open end. However, the use of the equation Length half-wave transformer $= \frac{492}{\text{freq. (mc)}}$ (V.P.), provided the V.P. is known, will be found to be accurate, and the above procedure is necessary only when one wants to use a cable of questionable dielectric.

Selecting Cable Impedance

To determine whether to use 52 ohm or 73 ohm cable to feed the "Trombone T," calculate the resistive term of the self-impedance of the radiator as a function of the wire size or tubing diameter from the table.* Calculate the resistive term of the mutual impedance from *Fig. 2*.* Combine the resistive terms of the self and mutual resistive impedances to obtain the drive imped-

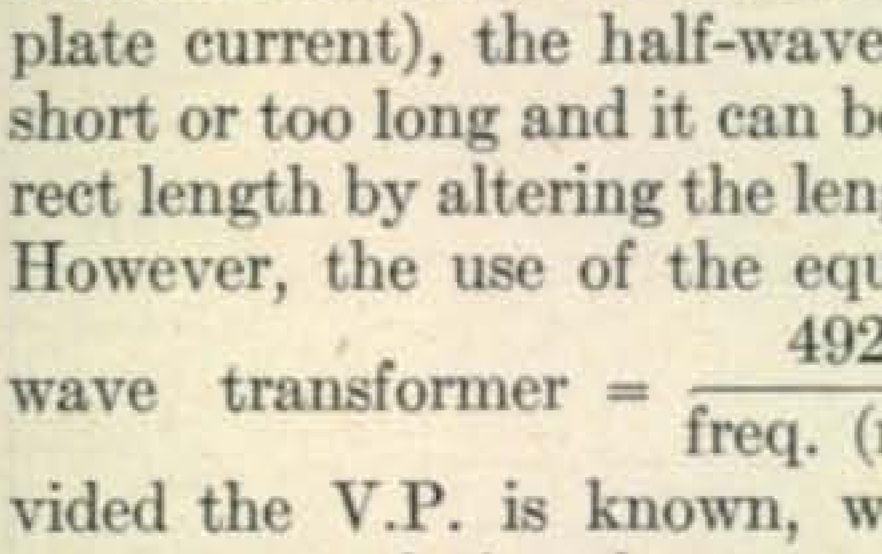


Fig. 10. Transformer used to effect the phase reversal necessary for proper operation of antenna.

ance. If the drive impedance is closer to 52 ohm than 73 ohm, use 52-ohm cable; if it is closer to 73 ohm than 52 ohm use 73-ohm cable. The half-wave transformer should preferably be made from 73-ohm cable although the effect of using 52-ohm cable will not be detectable.

Coupling to Final Tank Circuit

To couple the coax feeder to the final tank coil, use a link at the low-potential portion of the tank coil. In the case of a split stator final tank condenser, the rotor of which is at r-f ground potential, the link should be at the center of the tank coil. For a non-split stator final tank condenser whose rotor is grounded, the link should be positioned at the tank-coil end which is connected to the condenser rotor. That portion of the link winding nearest the end of the coil that goes to the rotor of the condenser should connect to the shield of the coax. The link should be wound around the final tank coil on the end which is at ground potential.

We recommend the "swinging link" arrangement, since the coefficient of coupling necessary to reduce the Q of the final tank coil to the value required to draw the desired plate current may be readily secured.

One word of warning. Be sure you have adequate insulation between the link and the final tank coil when the final tank coil is carrying the d.c. And we strongly recommend, as mentioned

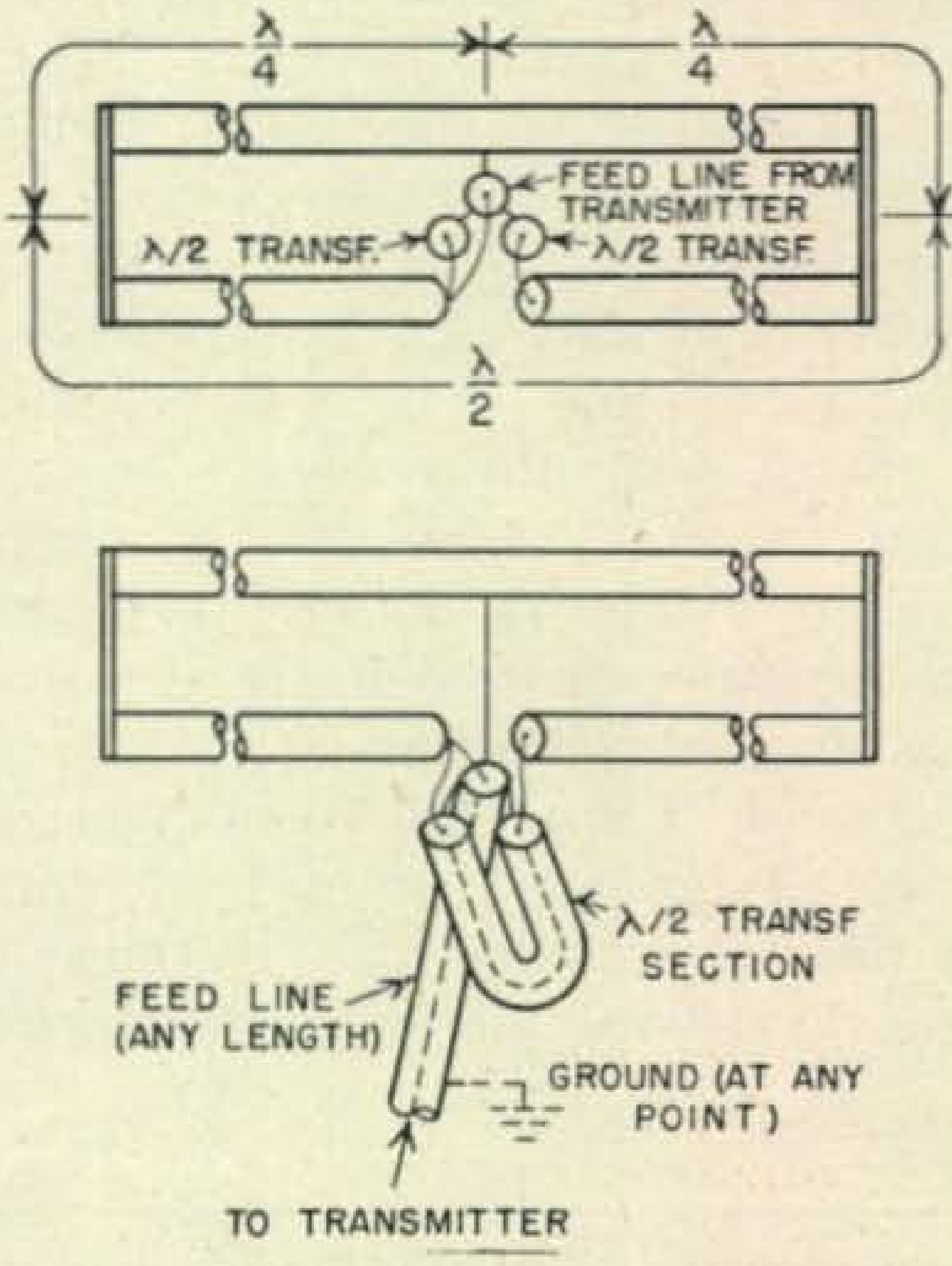


Fig. 11. Construction details of Trombone T.

previously, grounding the outer conductor of the coax feeder of the "Trombone T." Then if the insulation between the link and the tank coil becomes faulty (and the mechanical design of the link does allow this to happen quite frequently) all that can happen is a blown fuse. If the outside of the coax is not grounded, and the insulation between the link and the tank coil becomes faulty a real hazard exists and will escape notice until someone comes in contact with the outside conductor of the coax, perhaps with a fatal result! Of course, grounding the outer conductor also acts as lightning protection since even during transmission, the *entire* antenna system is grounded.

Installation

A description of the installation of the "Trombone T" at the writer's station, W2GWE, will be of interest to those desirous of duplicating the system. Practically any convenient mounting can be employed so long as the antenna itself follows carefully the original dimensions.

The writer had hammered together the 27-foot mast comprised of 15 foot long 2 x 3s as shown in

The "Trombone T," Part 1, CQ, March, 1947.

[*Continued on page 77*]

Compact Power Supply for the BC-221

Applying the new Federal selenium rectifier in a useful low voltage power supply

SELENIUM RECTIFIERS make an ideal inexpensive power supply for the BC-221 frequency meter or any other unit requiring a low voltage power supply. Well regulated output of about 135 volts d.c. is easily obtained. The exact voltage is dependent on the values of the filter input capacitance and the load (*Fig. 1*).

Because there is no rectifier tube to warm up the d-c output of the supply is available almost instantaneously. The new Federal miniature 5-plate 100-ma selenium rectifier is employed in the circuit *Fig. 2*. This rectifier is designed as a replacement for the 117Z6 series type rectifiers. The filter circuit consists of two resistors employed as chokes and either a dual 20 x 40μf, 20 x 20μf, or 40 x 40μf 150-volt dry electrolytic condenser. Together they provide adequate filtering for this half-wave rectifier circuit.

A separate 6.3-volt filament transformer was procured and its primary wired directly to the transmitter and connected in parallel with other filament transformers. This was done not only to utilize the fusing circuit of the transmitter but also to be able to locate and maintain the ground

[*Continued on page 72*]

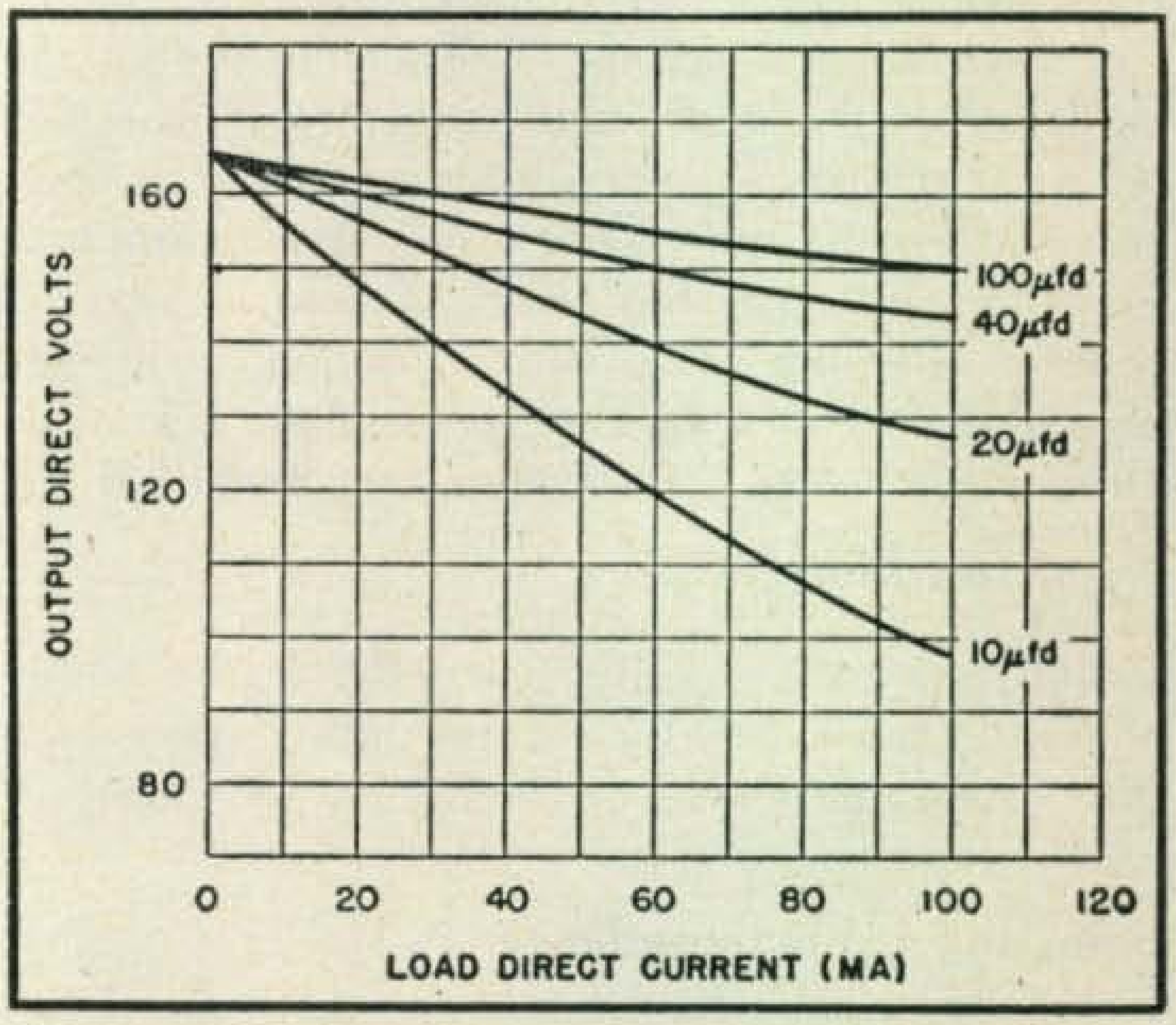
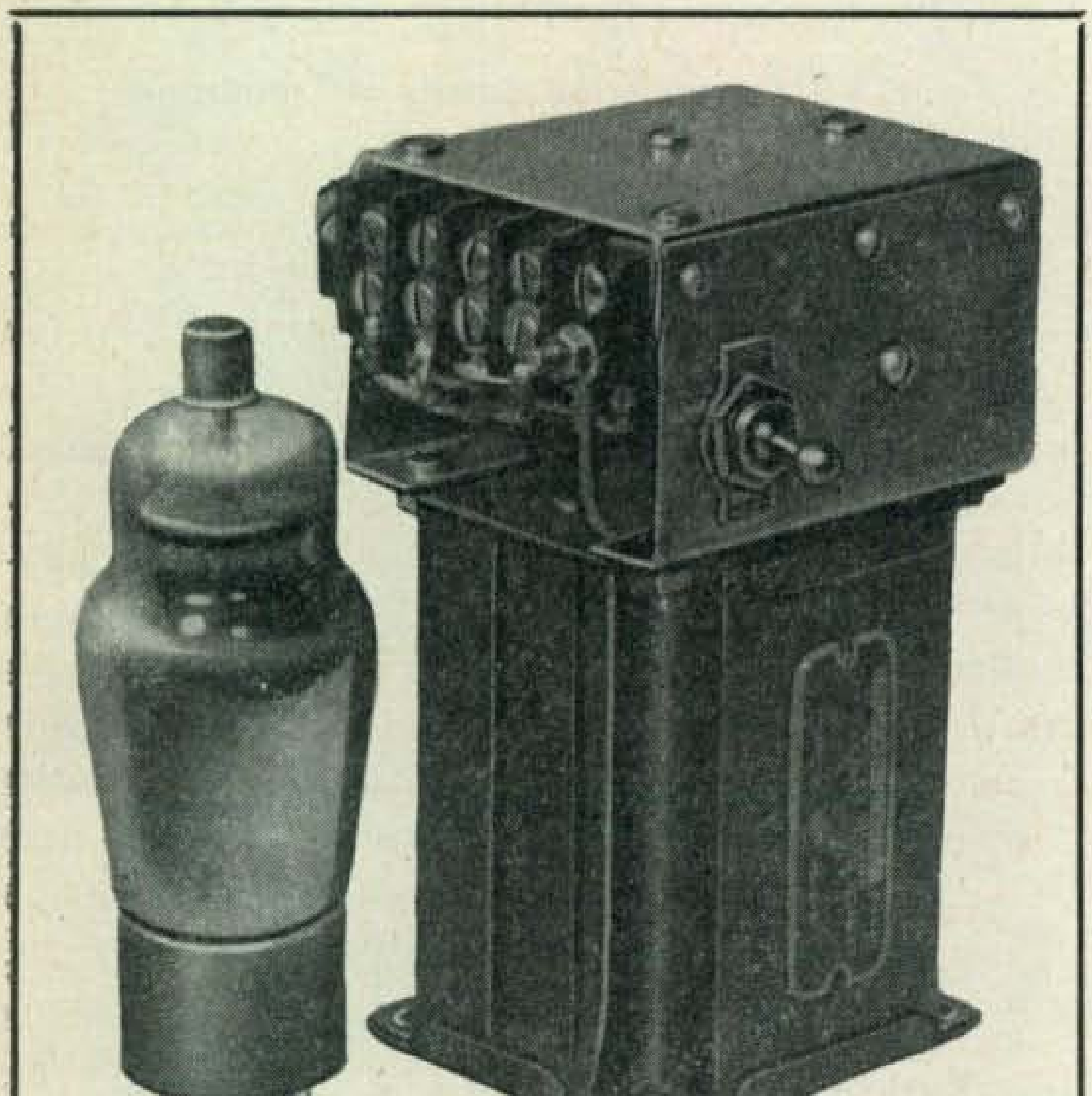
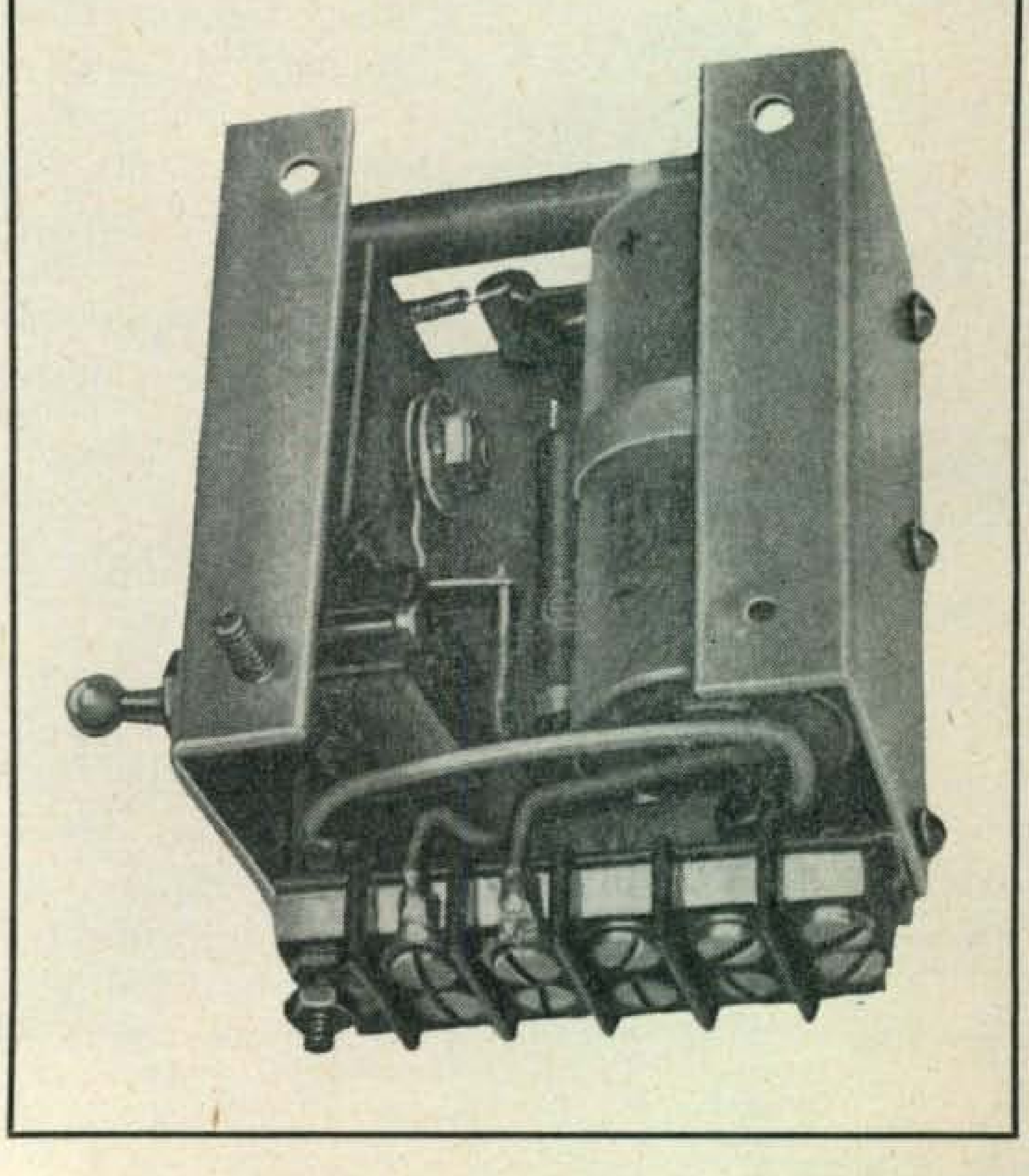


Fig. 1. Output voltage is dependent upon the value of filter input capacitance and load. Typical regulation curves using various values of filter-input capacitance with half-wave selenium rectifier.





(Above) Compact design make mounting on top of small filament transformer practical. A medium power rectifier is compared for size.

(Right) Simplicity of power supply is readily seen in this bottom view. Selenium rectifier is mounted next to the toggle switch.

The Amateur Newcomer

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

A series designed to equip the would-be ham to pass the FCC examination and get on the air successfully

THE PROCESS of becoming a licensed radio amateur is complicated by the fact that the examinations administered by the Federal Communications Commission, which the beginner must pass before he is issued his operator and station licenses, embrace three divergent phases each requiring different study techniques.

Anyone who has become sufficiently acquainted with amateur radio to want to become a ham undoubtedly will be somewhat familiar with these requirements, but we shall repeat them here for the sake of emphasis. Quoting from the FCC rules governing the amateur radio service:

> Sec. 12.42 *Elements of Examination*—The examination for amateur radio operator priviliges comprises the following:
>
> *Element 1. Code test*—Ability to send and receive, in plain language, messages in the International Morse Code at a speed of not less than 13 words per minute, free of omission or other error for a continuous period of at least one minute, during a test period of 5 minutes, counting 5 characters to the word, each numeral or punctuation mark counting as 2 characters.
>
> *Element 2.* Amateur radio operation and apparatus, including telephone and telegraph.
>
> *Element 3.* Provisions of treaties, statutes, and regulations affecting amateurs.
>
> *Element 4.* Advanced amateur telephony.

For the Class B or C licenses, it is necessary to pass elements 1, 2, and 3. For the Class A license, which entitles the holder to operate on certain restricted radiotelephone bands, element 4 is also required. However, the Class B license must be held for a year before being eligible for the Class A examination.

It is obvious that the first three elements of the examination may be grouped under the familiar headings of "code," "laws," and "theory." Element 4 is an extension of 2—advanced theory.

Taking The Examination

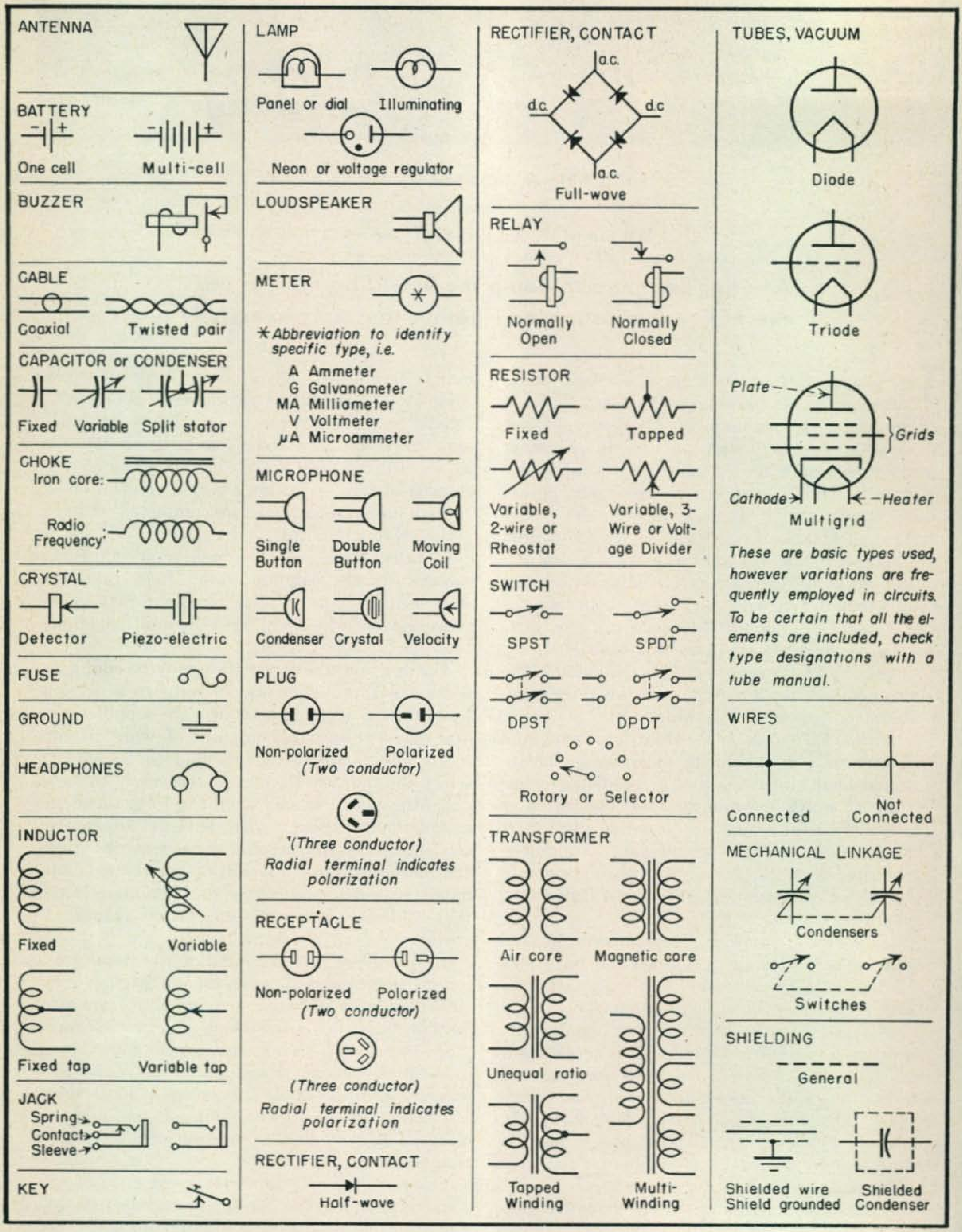
The candidate is first required to pass the radiotelegraphy (code) reception test. If this is completed successfully by copying 65 consecutive characters without error, the candidate may then take the radiotelegraphy transmission test, in which he is required to transmit correctly 65 consecutive characters within a period of one minute. In each case the test must be completed within a period of five minutes.

If both of the above tests have been completely successfully, the candidate may then take the written test. This consists of about fifty questions, most of which will be of the multiple-choice type.

The multiple-choice question may be confusing until it is thoroughly understood. In general it consists of a question to which are supplied several different answers, only one of which is correct. The candidate is expected to be able to select and indicate the correct answer. In some cases the question may take the form of an incomplete statement, with several alternative completions for the statement. Again, the question may be a mathematical one, and the candidate is expected to solve the problem himself and then indicate which of the given answers is correct.

It should be pointed out that the items from which the candidate must choose each correct answer may involve two or more which are very similar, but only one of which is entirely correct. For this reason the candidate must not only know the subject matter thoroughly, but must give careful attention to each question as he reads it. An incomplete understanding of the question may easily lead to the selection of an incorrect response.

Some of the questions may not require this type of answer. The candidate may be asked to draw elementary diagrams of radio apparatus and explain their functions, and he may also be asked to perform certain computations which involve only simple arithmetic. In any case, the most logical approach to the matter is to become familiar with the material so that he can answer



STANDARD SYMBOLS USED IN RADIO CIRCUIT DIAGRAMS

These are the most commonly used symbols for radio schematics. Although minor variations appear in different textbooks and periodicals, they will agree, in general with the standard symbols used in CQ circuit diagrams.

intelligently any question that may be asked.

Study Principles

In order to make plain the reasons for the kind of instruction which is incorporated in this series of articles, it is necessary to understand some fundamental principles of learning.

Probably the most fundamental principle, and the one that is most often overlooked, is that you have to work to learn. No one, no matter how good a teacher he may be, can do your learning for you.

This is not meant to imply that a good teacher cannot lessen the agony of learning—any kind of learning—for the student. Neither is there any denying that learning things is easier for some people than for others. What we do wish to point out is that the three phases of radio of which the FCC demands knowledge before it will issue you an amateur operator's license require earnest, diligent application and study.

Those portions of the examination which deal with the theory and practice of radio communications are easily learned in a superficial manner. Those portions which involve knowledge of the International Morse Code and of legal matters are less interesting, and therefore harder to learn.

Obviously, neither the code nor the laws, treaties, and regulations may be learned in the same manner as the theoretical and practical items. About all that a text can do is state the facts and encourage the learner to absorb them, this particularly with references to regulatory matters. Since these have been amply covered in recent issues of *CQ* and *QST*, and will be brought to your attention whenever amendments make this necessary, there is no need to take up space here in discussing them.

It is suggested, however, that certain sections of the regulations governing United States amateurs be particularly emphasized in your study. We refer especially to those sections which outline the things an amateur must *not* do, and the penalties for infractions of these rules. Of course, the would-be amateur should not slight other sections in order to concentrate on these. He should be sufficiently well acquainted with *all* of the rules to be able to answer any ordinary question about them, but he should be especially well acquainted with those sections which forbid certain actions, and with the penalties attached thereto.

The examination covering reception and transmission of the International Morse Code is the stumbling block of many aspirant amateurs. To the FCC it is primarily important that each amateur be able to send and receive in code, which is why the candidate may not proceed with the written examination until he has first proved his ability in this field. Moreover, within the limits, performance in the code test must be perfect—no 70 per cent passing mark here!

Learning the code is a purely personal matter in most cases. Some will be fortunate enough to have the opportunity of learning it in a class of some sort. These are often offered by radio clubs, YMCAs, Boy Scout groups, schools, and other agencies. Unfortunately, classes have schedules, and schedules often are hard for the individual to meet. Most present-day hams had to learn code the hard way, by working with one or two others, either hams or learners, and by listening to code stations on the air whenever it was possible to find one trasnmitting slowly enough to be readable.

No matter how difficult code may seem at first, the learner may rest assured that he *can* master it—if he will work hard and long enough.

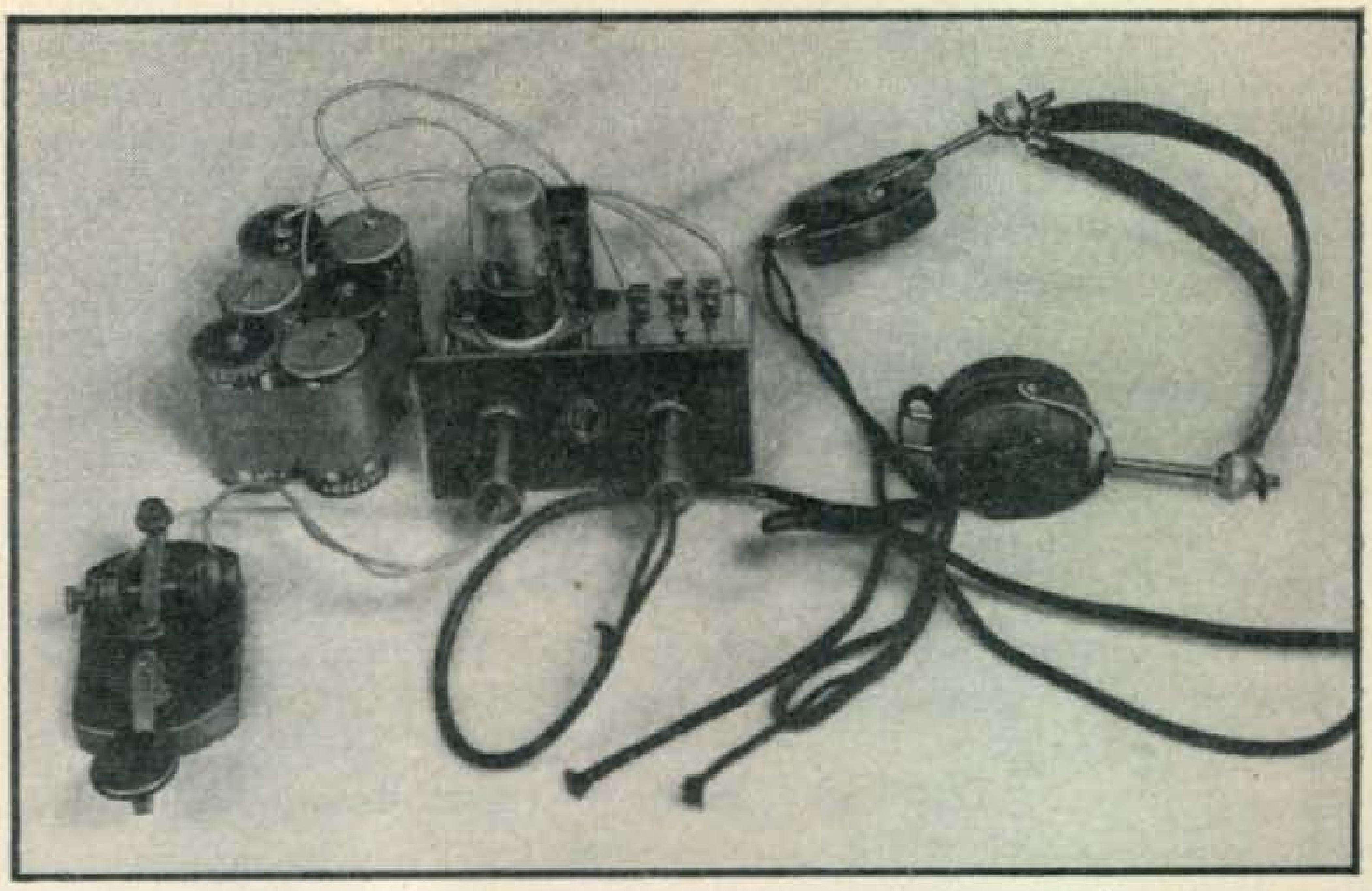
Learning the Code

Numerous articles on learning the code have been written by competent observers, but there are a few items which we should like to repeat, and one or two which we have not seen in print before.

The learner should practice his code often—as often as possible. The street signs you pass, phrases from the book or paper you are reading, may be whistled out in code, either audibly or inaudibly. This practice is valuable because it fixes the characters in the mind to such an extent that they are called up from memory automatically as they are needed, and within a few days the learner discovers that he no longer needs to think in order to decide which characters represent the next letter.

To repeat, frequent practice is necessary. Unfortunately, circumstance often dictates long practice periods at relatively infrequent intervals. If at all possible, this should be avoided. It is far better to practice fifteen minutes a day than to practice an hour and forty-five minutes once a week. If possible, try to get in three or more fifteen-minute periods each day. Or perhaps fifteen minutes will not be the right duration for your particular learning speed. If you tire, stop and come back to your code later.

If at all possible, get in a good portion of your reception practice by means of automatic transmissions of some nature—either phonograph records or code tape machine. The reason for this is that automatic transmissions have a different character from that of hand transmissions. They are perfect, technically, or nearly so. Hand sending seldom is; the small imperfections in hand transmission lend it character, blending into what comes to be an operator's "fist," as distinctive as his speaking voice.



Simple code oscillator shown with battery pack, telegraph key, and headphones.

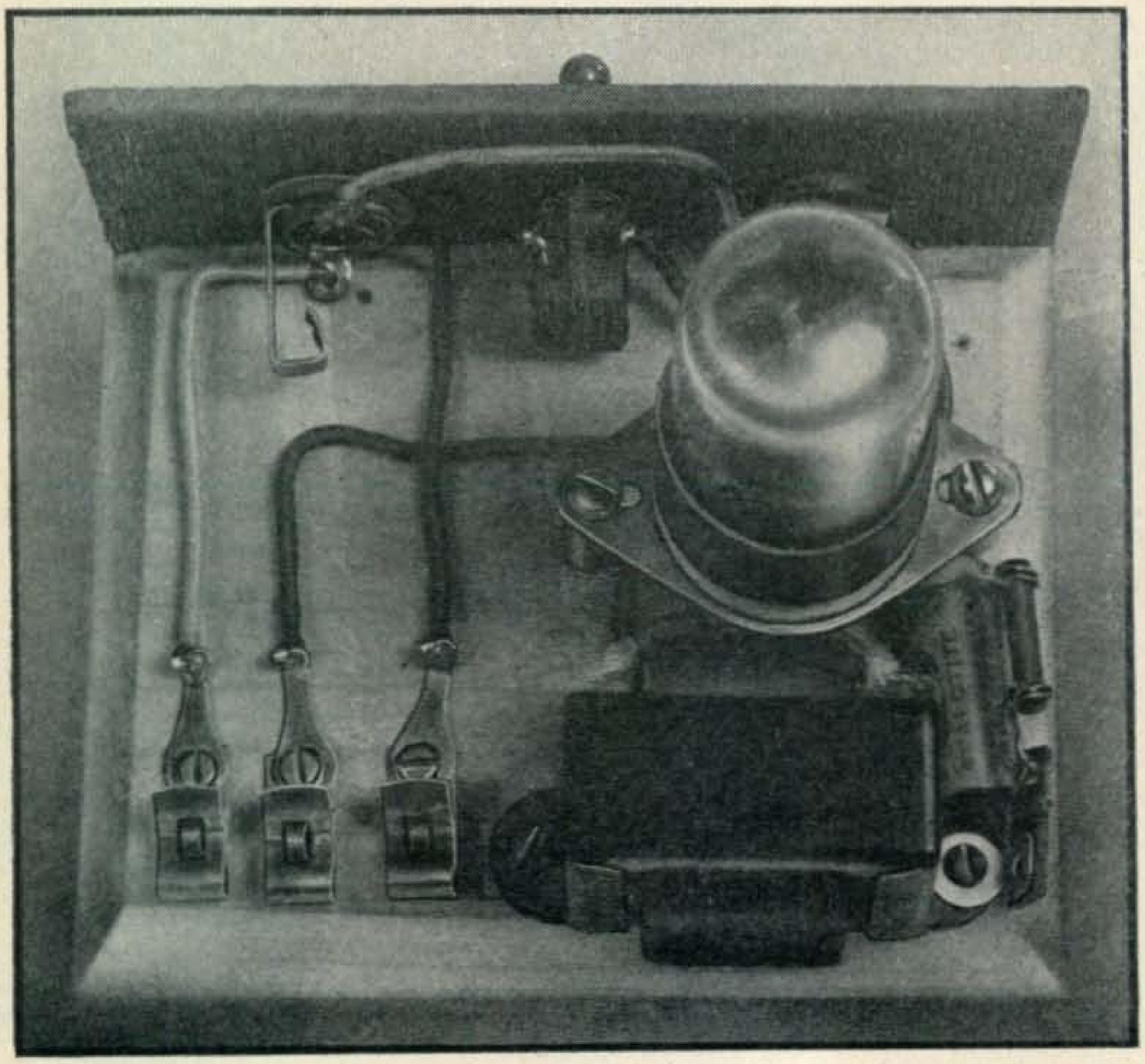
Since the FCC uses machine transmission for its code tests it is important that the learner become acquainted with this characteristic of regularity and perfection, so that it will not seem strange to him when he clamps a pair of FCC 'phones against his ears and tries to copy his 65 consecutive characters correctly.

It is, we believe, this very thing which gives rise to a large number of failures on the code test. Any number of hams—good hams, too—failed the code test the first time they tried it, and some have failed the second and even the third time. We know of one fellow who has failed six times and is still trying.

Do not get the impression that these people were congenitally incapable of learning the code. In no case has that been true; the person has been able to receive fifteen words per minute or better, but in each case the story has been the same: "When I heard that code popping out at me as regularly as a machine gun, I just froze up!"

This brings up another point. Be sure that your code speed attainment will permit you to send and receive several words per minute more than the FCC requirement of thirteen. If you have this additional speed reserve it will add to your confidence, and if you have any tendency to "freeze up" it will "thaw you out" a bit more quickly.

[Continued on page 56]



Close-up view of the code oscillator. The resistor and condenser are connected from a tie-point terminal strip, held by one of the transformer mounting screws, to the grid terminal (No. 5 pin) on the tube socket. Batteries connect to the Fahnestock clips at the rear of the breadboard

Setting the 6-Meter DX Record

A complete page of photographs will appear in the May issue.

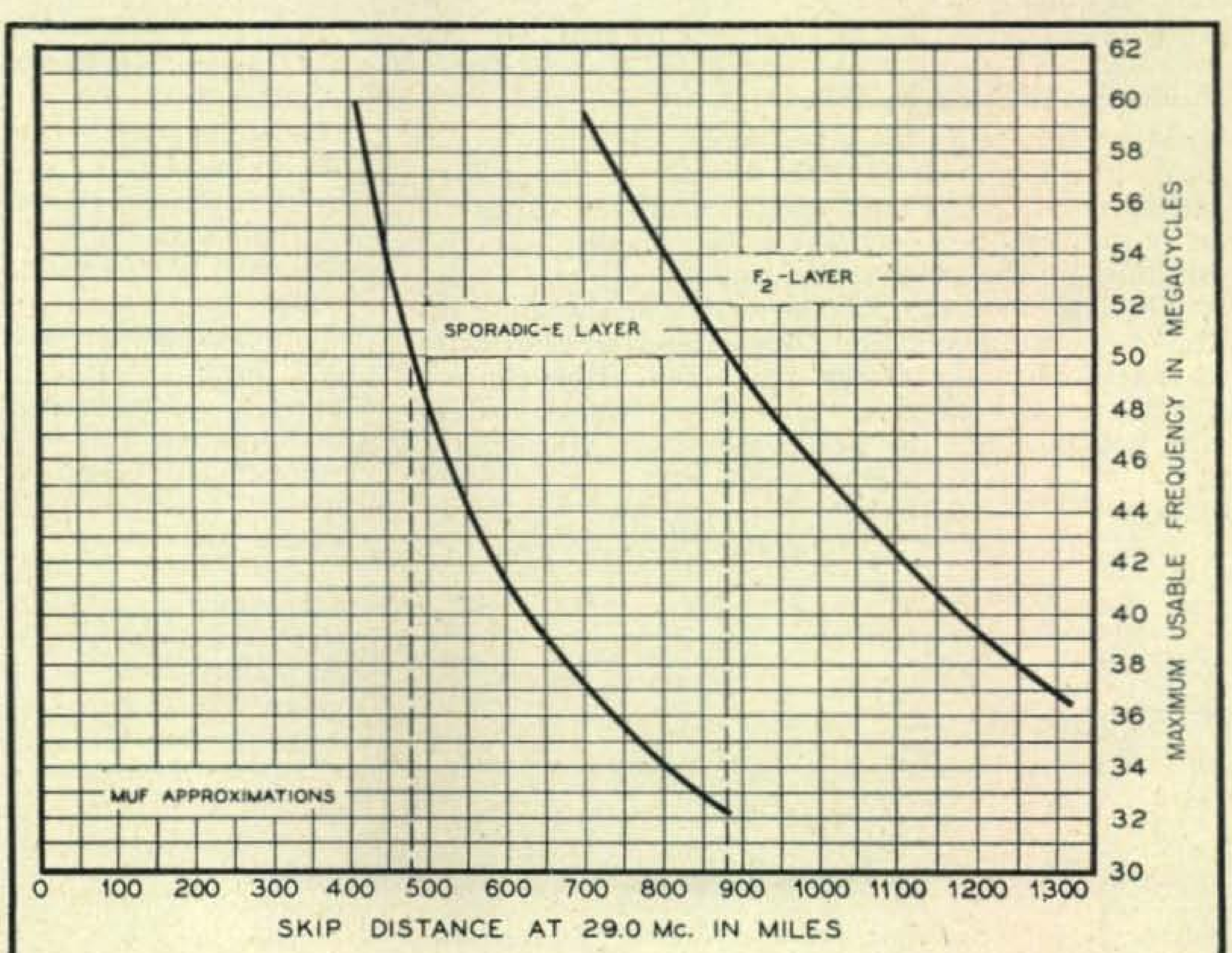
TEN-METER CONDITIONS were only fair on the morning of January 26 at J9AAK. Major *Tex* Brewer had worked about a half dozen W6s and was just about to close down when he decided to give a few CQs on 6 meters. Neither J9AAI or J9AAR could be raised (one had receiver trouble and the other was working on his transmitter), but suddenly an R-5 and S-9 signal was heard calling J9AAK. It was KH6DD In Ewa on Oahu Island, Hawaii nearly 4600 miles distant.

The rest is now history. The contact between J9AAK and KH6DD started at 0143 GMT and was carried on until 0212 GMT when J9AAK signed off to look for W7ACS/KH6 or any other signals that might be coming through. None were heard and time was taken at J9AAK to eat lunch and notify J9ABX over the telephone of the contact. Back at the Okinawa shack at 0303 GMT, J9AAK again called CQ and was heard and worked again by KH6DD. At 0318 GMT W7ACS/KH6 called KH6DD on the Hawaiian land line to say that his three-element beam had just been put up and he was hearing J9AAK. A three-way contact resulted, until 0328 GMT when the signals started to fade. W7ACS/KH6 was nearly out about ten minutes later and so to make the QSO 100% the three stations signed at 0339 GMT.

Being on one end of the longest v-h-f contact in history was the crowning triumph of an already outstanding day at KH6DD. After a 6-meter CQ at 2345 GMT (January 25), Bob Mitchell at KH6DD heard W6VDG/KW6 calling him on 10 meters. Brian Battensby on Wake Island reported that he was hearing the 50.001-mc signal of KH6DD at S-9. The cross-band QSO between Wake Island and Hawaii continued until 0030 GMT (January 26) when W7ASC/KH6 took time out from directing his pole raising crew to get in on the contact using his 80-meter Zepp antenna. At 0053 GMT the signals faded out.

On January 27, KH6DD worked W6VDG/KW6 from 0020 GMT until 0115 GMT when the band faded out quite suddenly. W6ONP/KW6 also copied KH6DD using an S-36 with a four-foot length of wire for an antenna. The contact was reestablished at 2342 GMT and this time fading out at 0005 GMT (January 28). Later on January 28, W6ONP/KW6 copied W7ACS/KH6 at 0430 GMT. Similar contacts between Wake Island and Hawaii were made on January 29 and January 30. By February 2

[*Continued on page 64*]



Cross-band MUF approximation graph to indicate the MUF in areas where the 10 and 20 meter skip distance may be observed.

Inside the SHACK AND WORKSHOP

Conducted by A. DAVID MIDDELTON, W1CA*

"Nut Extractor" for Socket Wrenches

Radio men find socket wrenches, commonly called "Spintites," very handy in removing or installing nuts. However, these nuts have a habit of getting

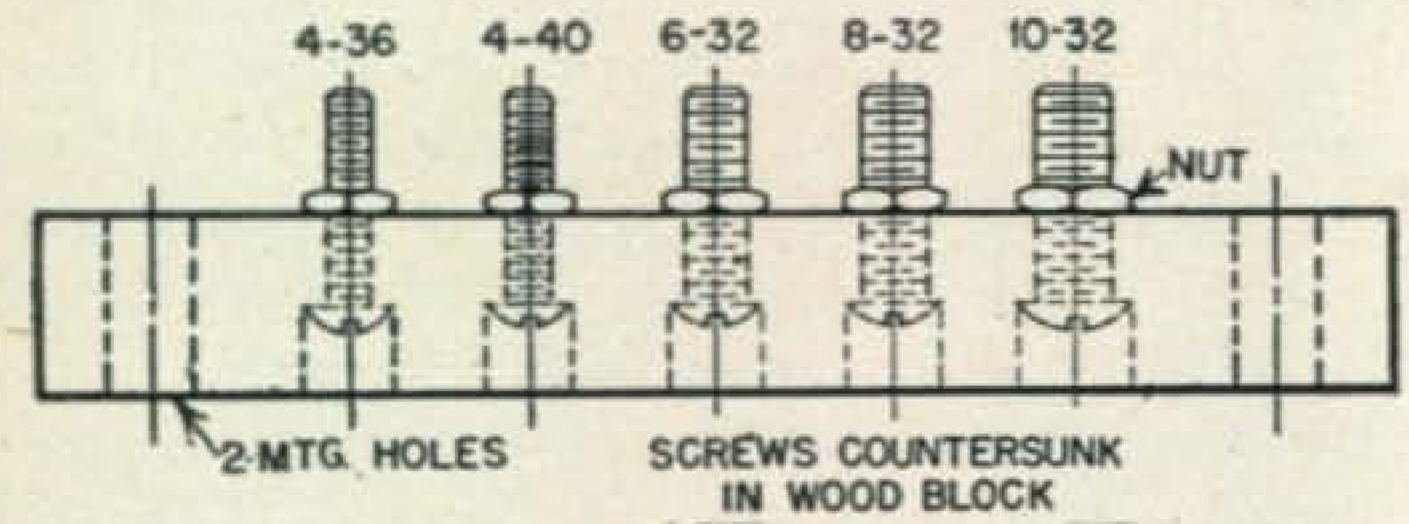


Figure 1

tightly jammed in the wrench and no amount of coaxing will loosen them. The common, but not so successful methods of extraction include tapping the socket wrench on a hard surface or fishing for the nut with a piece of wire or a tool.

After being confronted with this problem on numerous occasions, I built the "nut extractor" shown in *Fig. 1*. This gadget consists of a small block of wood through which protrudes a sample of each of the commonly-used machine screws. Each screw is held in place by a retaining nut, and the "nut extractor" is fastened permanently to the work-bench.

The operation procedure is simple. When a nut becomes jammed in the socket wrench, a few turns onto its corresponding screw and the wrench may be cleared quickly and easily.

Rufus P. Turner, W1AY.

An Improved Stand-by Switch

Many amateurs use a toggle switch in the center-tap of a high-voltage transformer winding for a stand-by switch. This is almost a universal practice in power supply units where the heater voltage is supplied by the plate transformer.

There is one disadvantage to this method, because the d-c output voltage appears across the switch contacts when the circuit is opened. Regardless of their current carrying capabilities, these switches are not designed to break the high voltage thus encountered and the resultant arcing is a common cause of erratic operation and premature switch failure. One simple way to minimize this trouble is to use a DPST instead of the SPST switch as shown in *Fig. 2a*. By wiring the two elements of the switch in series as shown in *b*, the double-break action restricts arcing.

This has proven to be an effective method of connecting a stand-by switch in several varied types of equipment.

E. Black, W2ESO.

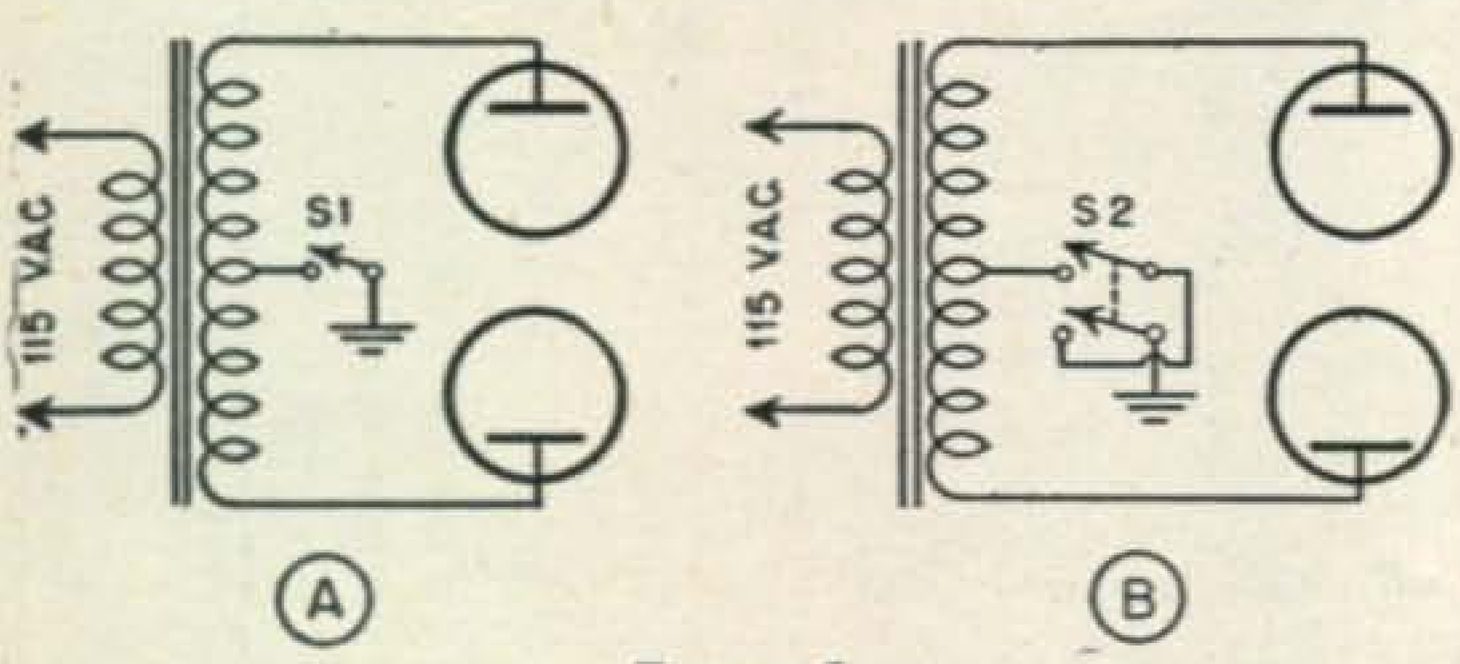


Figure 2

A 425-Mc Mixer Unit

A concentric line mixer for 425 mc is shown in *Fig. 3*. This simple unit is made from a Rumford baking powder can and a ½" copper tube. A crystal diode rectifier tapped half-way up the inside conductor is connected to the i-f input by means of a coax lead. Capacity coupling from an oscillator furnishes the required injection voltage.

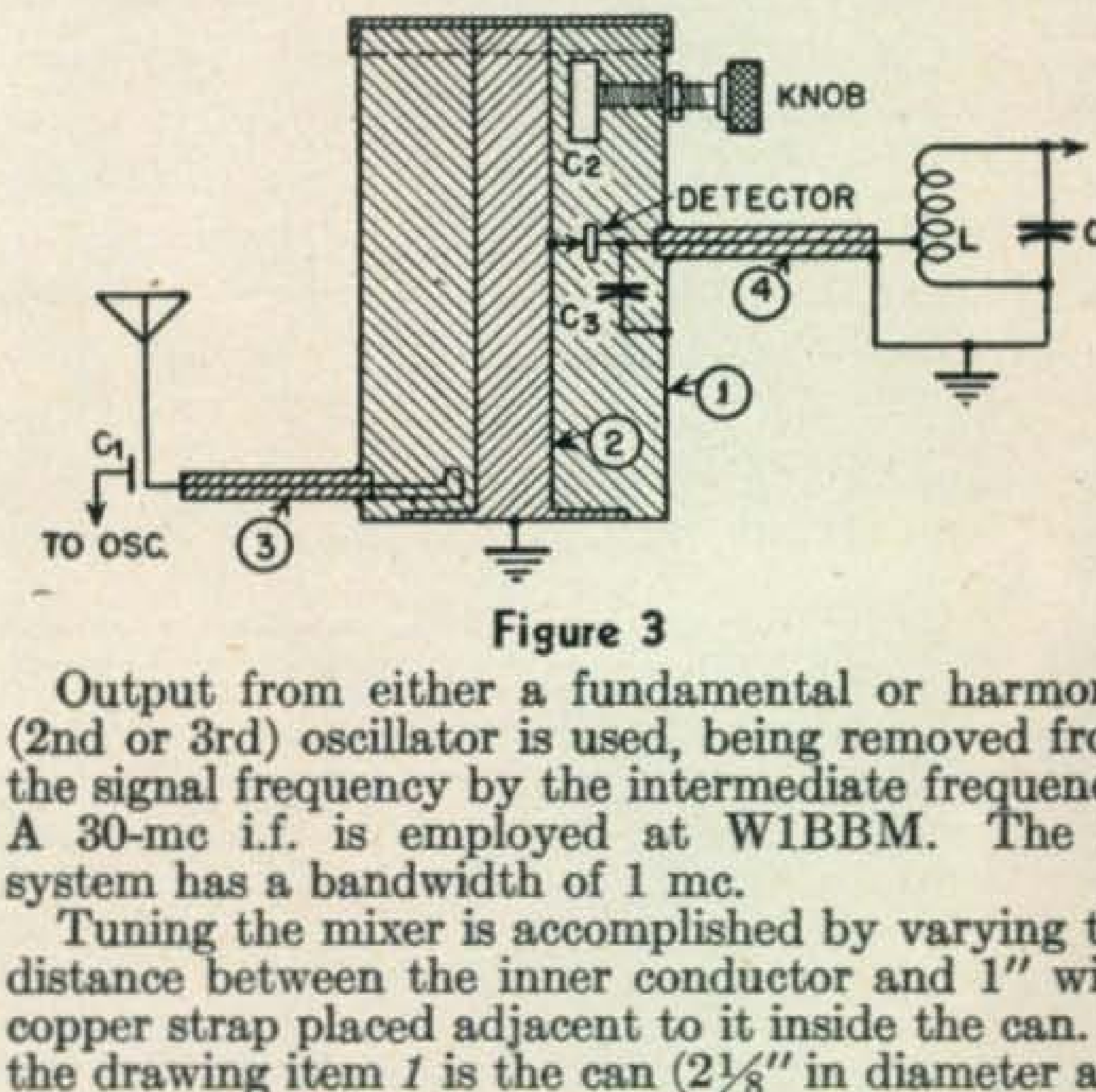


Figure 3

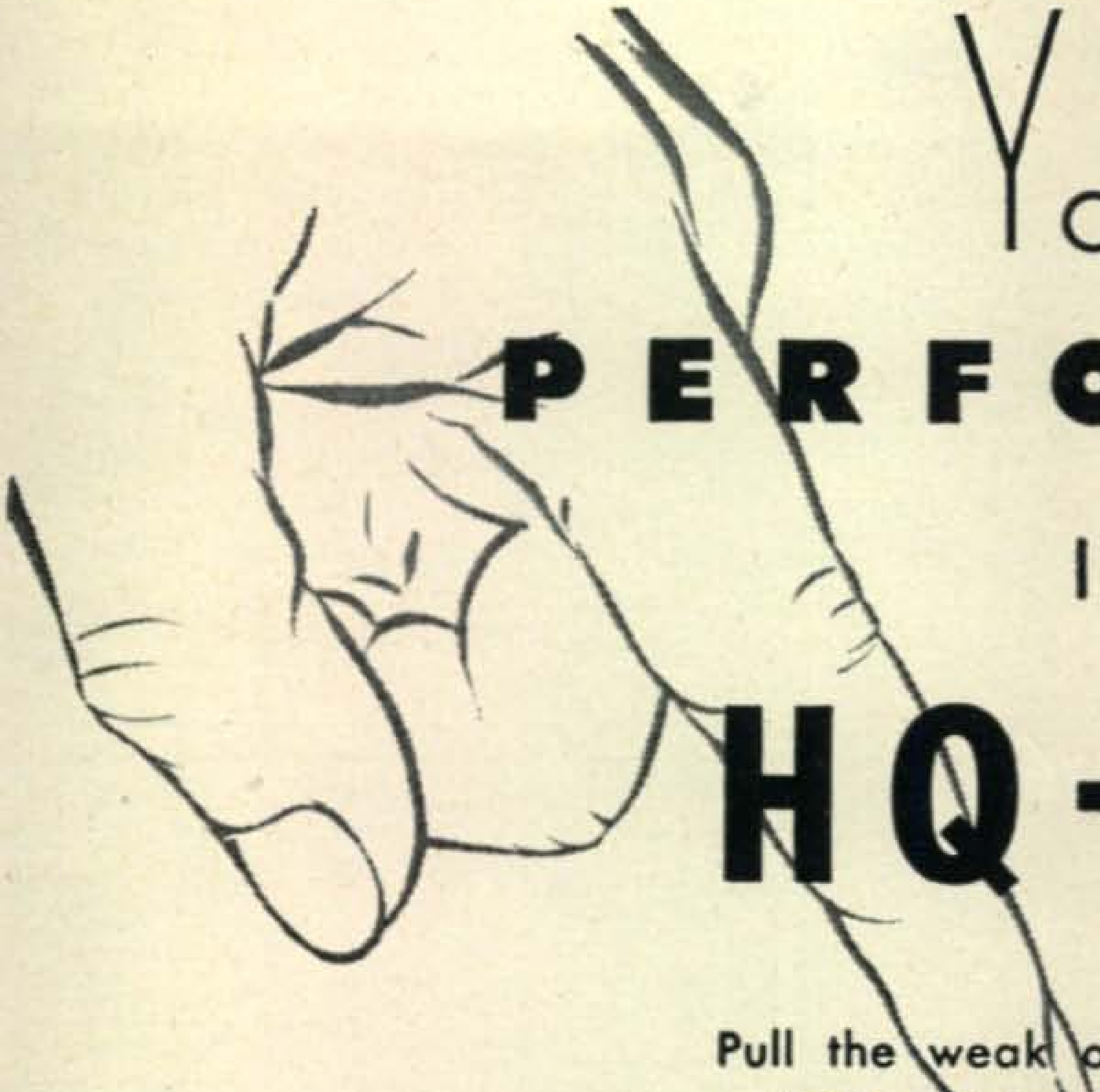
Output from either a fundamental or harmonic (2nd or 3rd) oscillator is used, being removed from the signal frequency by the intermediate frequency. A 30-mc i.f. is employed at W1BBM. The i-f system has a bandwidth of 1 mc.

Tuning the mixer is accomplished by varying the distance between the inner conductor and 1" wide copper strap placed adjacent to it inside the can. In the drawing item *1* is the can (2⅛" in diameter and 3½" long). *Two* is the inner conductor formed from a piece of ½" copper tubing, split at the bottom and fastened right through the base of the can onto the wooden baseboard. Items *3* and *4* are coaxial leads made from pieces of insulated wire inside shield braid.

The capacity formed by the lead from the oscillator wound loosely around the antenna connection is *C1*. A pickup loop consisting of a "hairpin," furnishes antenna coupling when located close to the grounded end of the inner conductor. *C2* is the capacity formed by the 1" copper strip located inside the can and adjacent to the "hot end" of the inner conductor. This capacity is varied by means of a screw device turned by an external knob. A 3-30 $\mu\mu f$ midget trimmer *C3*, is located inside the can. The output is tapped one turn up from the grounded end of the i-f system input inductance, *L*, tuned by *C4*.

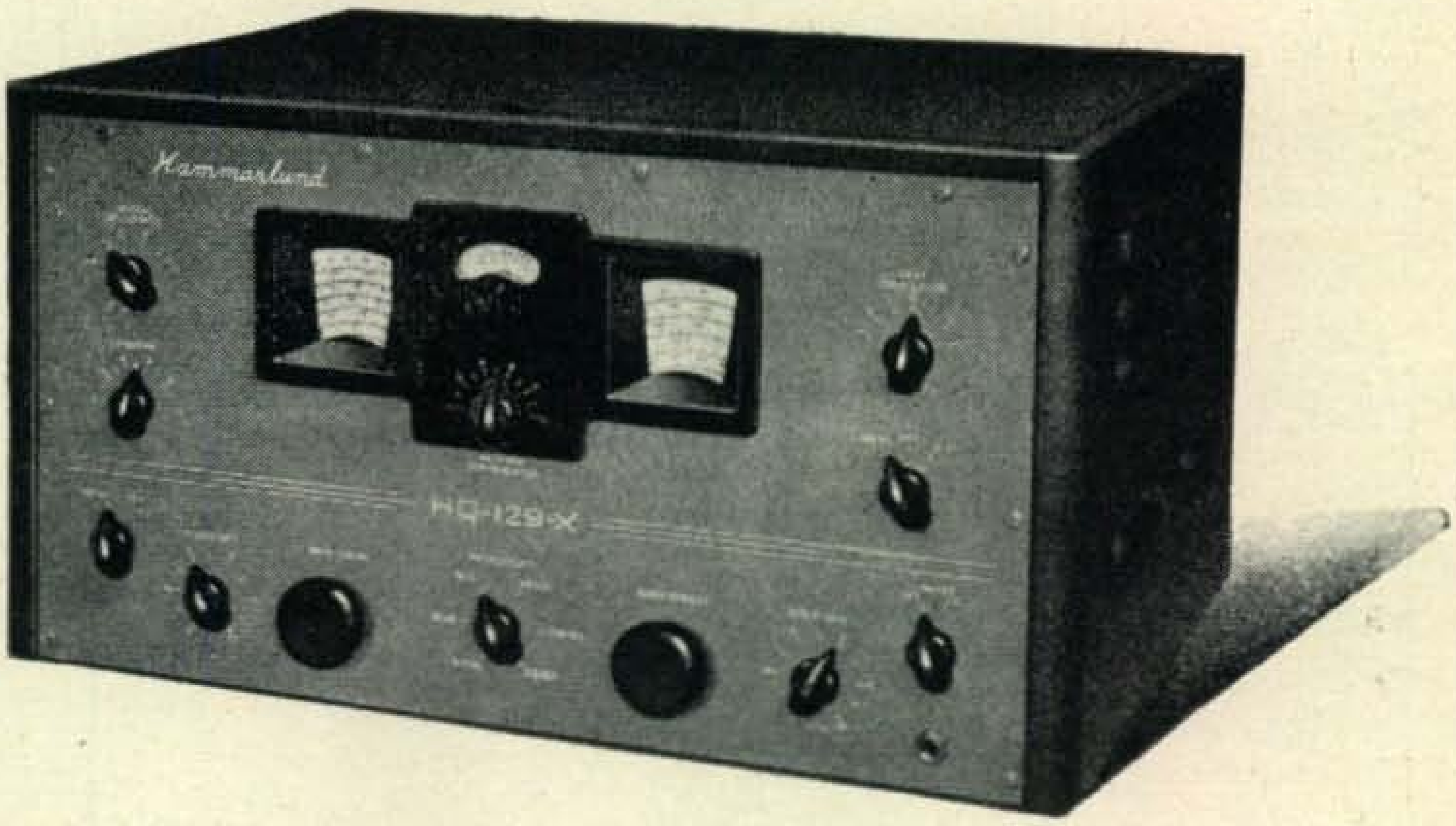
B. W. Bates, W1BBM.

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



YOU BUY PERFORMANCE IN THE HQ-129-X

Pull the weak ones out of the QRM—Tune in a "ZL" and hold on to him—Turn on the noise limiter and really kill ignition noise—That is what thousands of hams are doing every day with the **HQ-129-X**



BACKED BY 36 YEARS OF KNOW HOW

see the HQ-129-X at your dealer's

THE SIGN OF QUALITY
ESTABLISHED 1910

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., NEW YORK 1, N.Y.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

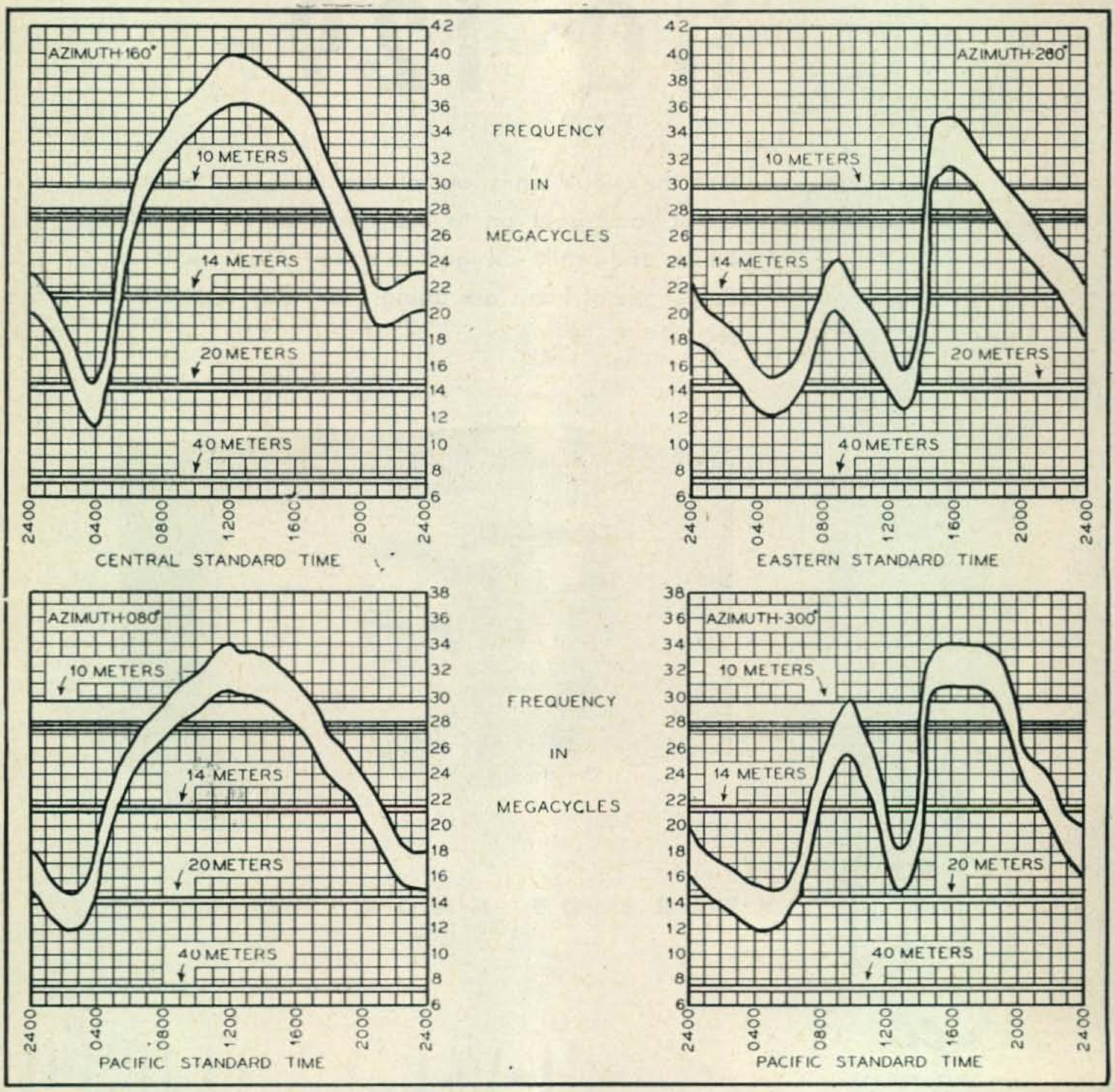
Monthly DX Predictions - - - APRIL

OLIVER PERRY FERRELL

LAST DECEMBER at a ham club meeting several score amateurs were somewhat surprised by the long-range DX predictions made by the writer. These predictions indicated that during February and March of 1947 the DX conditions would equal and possibly surpass those November, 1946 and that the conditions in November, 1947 would exceed any previous period in the history of amateur radio. Whether these long-range predictions will come true remains to be seen. However, a little while back an article in *Scientific Monthly* attracted our attention, because we must associate our improved high-frequency DX conditions with the maximum of the sunspot cycle. But, the question is when is the maximum due?

According to the author of this article, Dr. H. T. Stetson, the sunspot maximum will probably occur in February or March of 1948. On the other hand, several physicists and astronomers have different ideas on the subject.

[*Continued on page 86*]



Predicted DX conditions for April over various long transmission paths. The outer or upper curve denotes the maximum usable frequencies and the inner curve the optimum working frequencies. Fig. 1. (top, left). Central United States to Argentina. Fig. 2. (top, right). East coast of United States to Australia and New Zealand Fig. 3. (bottom, left). West coast of United States to South and Central Africa. Fig. 4. (bottom right). West coast of United States to Singapore. Notation of the azimuth from the United States areas is made on each graph.

CQ DX

By HERB BECKER, W6QD

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

THIS MONTH'S COLUMN is being turned out under a handicap. I haven't had time to get acclimated to the swell California climate, after returning from a few weeks jaunt down east. When a guy does a little traveling around, it's not the easiest thing to arrange trips to conform to 2IOP's deadline. So, if the column, every now and then, appears to be worse than others, you can charge it up to the fact that I find it necessary to take an occasional trip; all this being done with the idea of making a living. Anyway, from the gossip I have heard re the DX contest, you fellows were really in there pitching. I would like to have been in town myself for the shindig, but couldn't make it. Incidentally, I had a get together with W2GWE, W2ESO and W2IOP while in New York. Yes, we discussed DX, I think. In Boston, I had a session with W1FH, W1KKP, and W5CI, who happened to be in town, although, by his own admission, not much of a DX man. While in Chicago I went out to see W9AIO's new rig, and couldn't resist the temptation to work some of the boys back on the west coast. Boy, those sleet and snow storms! Enough of this stuff, let's see what's in the mail bag.

C.W Chatter

W6SAI is up to 39Z and 107C including Zone 23, *AC4YN*. WØGKS, Doc. Gross, has submitted a nice all time and post-war zone and country list; post-war 36Z and 79C; all time is 37Z and 117C. After looking over the new Official Country List, Doc decided to send in a complete new list to take care of a few countries which were deleted, as well as to take care of some additions. A typewritten list like this, showing the country, call letters of the station, date and time, will make it much easier on us in compiling the Honor Roll. It would seem to me that you could take the Country List, as published in CQ, check off the countries worked, and compile your typewritten list accordingly.

W2GVZ has an all time total of 39Z and 126C, and his post-war is 17Z and 33C. Pat has a little way to go to catch up to his pre-war total, as you can readily see, but he is a patient guy, and he'll make it. W6TI, in working *HZ1AB*, found that he was using a pair of 813s in parallel and has two Super Pros (don't suppose these are in parallel, however). HZ1AB said he was operating part of each day on phone, 28,450 kc, and his QRA is:

HZ1AB 1432 A.A.F.B.U., APO 816, % P.M. New York City. 6TI also worked *VP2UB* on Andaman Islands on 20 c.w., and his QRA is:

"Derke" Radio VU2PB, % R.A.F. Signal Section, Port Blair, Andaman Islands. *VP8AD* told 6TI he was on South Georgia Island, and to QSL via RSGB. He is on 20 c.w. Also on 20 c.w. is *PI1L* telling W6TI his QRA is:

PI1L, Communications Dept., Netherlands Aeronautical Navigation The Hague, Netherlands. Still another one worked is *I6USA* located in Asmara, Eritrea. His mailing address is:

I6USA, Master Sgt. Jesse Goldstein, APO 843, % P.M. New York City

W9NRB sends in a nice typed list showing post-war totals of 38Z and 107C. Smitty says he is doing better work now with a pair of 809s and a three element beam than he did before the war at the same QTH using a kilowatt. He says a guy doesn't need high power just a good antenna. Why not both? W9KA is back on the air using 60 watts and is off to a pretty good start working *XU6GRL*, *UN1AO*, *W6VKV/I6* (I6USA?), *FF8WN*, *CR9AN* *OX3GE*, and *KA1ZU*. A few QTHs submitted by W9NRB are as follows:

VE8NG, Sgt. Jack Willis, B.E.M. Aklavik, N.W.T. 68° 15'N—135° W.

PK4KS, Tan Koon San Pangkalpinang, Banka, N.E.I.

PK1RI, Riet Soloweg 13 Batavia-C Java, N.E.I.

C3YW, S.H. Chen, China National Aviation Corp., Foochow, China

ZB2B, A.E. Glass, Rock Wireless Station, Gibralter

OH2PKP, Kantanen, Pukinmaki Pakantie 13 Suomi, Finland

PK6HA, Lt. A. Hagers, N.E.I. Air Force 3 V.B., Biak Isle

FF8WN, Walter T. Moore, % Pan American Airlines, Dakar, Senegal, Africa

OA4BB, V.F. Woolman, Panagra Lima, Peru

PZ1FM, O.W. Frijmersum, Box 118, Paramariro, Surinam

W9KMN is in with his list showing 25Z and 45C. His rig consists of a pair of 813s running 400 watts; antenna is a 68 foot single wire fed, and is used on 10, 20, and 40.

W6JFJ has worked 23Z and 37C. He mentions working a station signing *HP4Q* on about 14,340. Bruce says it sounds a little far fetched, and, frankly, it did to us too until we received some info from W6WB. Keep reading . . . you'll find it.

W5LF has worked 32Z, but failed to mention the number of countries. How about it George? W8PCS has 19Z and 29C, with an all time total of 22Z and 43C. PCS has been out of the service for about a year and was using low power until November, when he got a pair of 35Ts working with 350 watts.

Some of the boys have asked what has happened to Curacao, Tinian, and Saipan. The proper classification for these countries in the new country list is Netherlands West Indies, which includes Curacao, and Aruba, etc.; and, secondly, Marianas Islands which includes Guam, Tinian, and Saipan.

W4QN now has 30Z and 72C with an all time total of 35Z and 118C. One of his latest and best is *VQ6HOS* in British Somaliland. He doesn't mention, however, the band, and if on phone or c.w.

It is good to hear from W8ZY. Karl says he doesn't have much time to get on the air any more, but he did work *XU6GRL* on 20. Karl is still using a single 250TH on 20 and a pair of VT-127As on 40.

WØAZT of Denver has added 3 new zones making a total of 25Z and 44C. *VE8MF* gives his QTH as:

VE8MF, Clyde River, Baffin Island, Canada —QSL to Box 374, Wiarton, Ontario, Canada

Here's a new way to read meters ... *in the dark!*

How often have you wished for a meter you could see *clearly*—the whole scale of it, wherever you were using it—in the dark, under low lights, or even in the kind of glare that causes reflections on the glass—a really illuminated meter for your transmitter? Well, here it is—the result of a new Simpson patented method of illumination.

On these new Simpson Illuminated Meters (A.C. and D.C. voltmeters; D.C. milliammeters; and Radio Frequency ammeters), every fraction of the dial face is flooded with a full and even radiance—there isn't a spot of shadow.

An ingeniously shaped Lucite cone carries the light from a recessed bulb in the back of the instrument through the front edge that surrounds the entire dial. This makes possible the use of the standard Simpson metal dial. Unlike translucent dials, it cannot fade or discolor so that reading becomes difficult. It cannot warp or buckle, causing the pointer to stick, or distorting readings. The bulb recess is neoprene sealed.

Behind this refinement to the basic reason for preferring Simpson instruments—their in-built accuracy. That high quality which is the indispensable component of every Simpson instrument makes sure that the accuracy will *stay* there, year after year.

ASK YOUR JOBBER

3" Rectangular Case. Width, 3"; height, 3-1/8". Mounts in round hole. Body diam. 2¾".

2" Rectangular Case. 2-3/8" square. Mounts in round hole. Body diameter, 2-3/16".

SIMPSON ELECTRIC COMPANY
5200-5218 West Kinzie St., Chicago 44, Ill.
In Canada, Bach-Simpson Ltd., London, Ont.

Simpson

INSTRUMENTS THAT STAY ACCURATE

THE NEW SIMPSON MODEL 240
"HAMMETER"

1946 version of the first self-contained pocket portable instrument built expressly to check high voltage and component parts of transmitters and receivers.

Ranges: 0-15, 150, 750, 3000 A.C. volts; 0-15, 75, 300, 750, 3000 D.C. volts; 0-15, 75, 300, 750 D.C. milliamperes; 0-3000 ohms (center scale 30). 0-300,000 ohms (center scale 3000); 1000 ohms per volt A.C. and D.C.

WØAZT dropped in to see Jim Cheeks, who was operating *ET3Y*, before returning to Denver. Jim said he was planning to return to Ethiopia in about a year and will take a complete kilowatt phone and c-w station with him. W6ENV worked a couple of good ones on 20 c.w. One is *YI1DD* located in Bagdad. This one appears to be O.K. as he has a sister living in Los Angeles, and she says, "Yep, that's where her brother is located." The other one for ENV is *UG6WG*. W2ZA has 33Z and 76C postwar, with an all time total of 39Z and 151C. W2ZA agrees that it is somewhat of a waste of time to list the frequencies of the DX stations now a days due to the boys hopping all over the band. We will try to indicate, however, which band they are on. W2PUD has 28Z and 63C for his post-war total. W9EGQ says he has actually worked two countries and 3 zones . . . and, I wouldn't be a bit surprised that he means it. He wants to know if he should consider W2IOP as a country!! Could be . . . but we never figured on it.

From G2MI's column, we hear G5QA has completed his 1000th contact with ZL2OU. Except for the war years, they have kept a daily schedule since 1938. *YI2WM*, *YI6T*, *YI6C* can all be QSL'd via Signals Officer, Shaiba, Iraq.

QTH: *VP8AI*, Alan S. Betts, Pebble Island, Falkland Islands

G3APX says *OX5JJ* is Jorge Jorgensen, Cape Adelaer, East Greenland, and will QSL 100% when the next boat puts in. G8VR says Ham radio in Roumania is rather risky. YR5W tells him that public suspicion is aroused if anyone attempts to hook up with Britain or America. There is a strict postal censorship, and all cards to this country should be sent via RSGB. Still from G2MI's stuff, we see the address of the Indian QSL Bureau is Lt. Col. Whatman, Royal Signals, C.S.D. (I. & E.) Sunderwals, Dehra Dun, U.P., India. This fellow, incidently, is *VU2BC*.

W7FNK worked a station signing *EK4AZ*, January 24, 4:15 noon, on about 14,100. He wants to know if anyone knows anything about him. We don't. W8CVU has worked *UAØKTU*, *EK1AA* and *XAFD* in Austria, who says to QSL via RSGB.

From what few reports I have had of the DX contest, thus far, it looks as though a lot of the old time foreign stations have once again broken loose. For example, in the phone contest, *HP1A* and *VP6YB* were there, such as they were always in contests before the war. W8NBK has worked 30Z and 80C post-war; all on 10 meters; some c.w. and some phone. W4OM, who is ex-W3FQP, has 36Z and 89C, with an all time of 39Z and 136C. W4OM got a thrill out of his one hour and 32 minute WAC on January 22, when he called 6 stations and worked them, one on each continent.

G6QX is still building things, but has managed to get 20Z and 44C. Bob has been having antenna trouble but recently built himself a 41′ "A" frame, which should sport an antenna or two. No sooner did he get this stick up in the air, than up sprang a gale, the telephone rang at his office, and his XYL was telling him something about a big chunk of wood, and a lot of wires seemed to be mixed up in her rose bushes. Sure enough, the gale chopped off 8′ of his mast . . . now it's a 33 footer, and he is back where he was before the war.

If any of you fellows have worked *VS1ON*, *VS2QEU*, and *W6QEU/VS1* during January February, and March of 1946, you can get a QSL card by sending yours to Peter Onnigian, Route 4, Box 451, Fresno, California. They were located in Singapore, Malaya, and operated on 10 and 20, both phone and c.w. Also, if you worked *HS1SS* on 20, these same boys were operating for two weeks in Bangkok, Siam.

W2PNB runs 45 watts to an 815 and has worked a flock of Europeans on 80 meters. Stations include *F3MS*, *G6RB*, *G8TK*, *G5LI*, *G8JR*, *PAØUN*, *HB9EI*, *OK1LM*, *ON4AU* and a bunch of others, most of which were between 3500 and 3600 kc.

W6ENV was telling me of the endurance contest existing the other night on 20 c.w. when the whole country was bearing down on *LZ1XX*. It seems that the fellow had been on the air for nine hours straight, and after a short intermission, was back for another hour of it. During the ten hours of operation, LZ1XX worked 102 stations. W6ENV also dug up the QTH of VQ6HOS, it is:

VQ6HOS, J. R. Endall, 46 Salisbury Rd., Moseley, Birmingham, England. I believe VQ3HJP originally got the ball rolling on getting the address.

It looks like old home week, because we finally cracked down on W6WB, Bud Bane. He has been out of this DX racket for so long, it kind of seems like old times to hear the guy going after the stuff with a vengeance. Bud says that *HP4Q* is under cover, but he is O.K., as he has received a card. Also heard *VS6AA* working W6WB, as well as W6CHE, but he is on a ship anchored in the harbor at Hongkong. Now we can look forward to the age old argument, "Is a ship a country?" Some of the best at W6WB include *LA4LA* in Spitzbergen, *EP3D*, *EA9AI*, *ET1JJ*, *SV1RX*, *HI8MAF*, *HZ1AB* *EK1AA*, and *VQ8AD*. Bud also kicks through with a few QTHs.

CP1AP, P.O. Box 346, La Paz, Bolivia

HI8MAF, Max Fiello, PAA, Trojillo City, Cominican Republic

CT2XA, APO 406, % P.M. New York City

CT2WX, 53 Reconnaissance Squadron, Azores, APO 406, % P.M. N.Y.C.

EA9AI, Dr. Mora, Melilla, Spanish Morocco

PK6EE, Box 76, Macasser, Celebes, N.E.I.

G6QB, who, incidentally, writes the DX column for the "Shortwave" magazine published in London, has 38Z and 107C post-war. He doesn't have far to go to reach his pre-war total of 38Z and 136C. Tommy works mostly on 28 mc but occasionally gets on 14 mc for a few QSOs. His transmitter winds up with a pair of 807s.

XU6GRL, Nanking, China

The following letter has just been received from our good friend Doc Stuart, XU6GRL, and thought

Doc Stuart, XU6GRL and his XYL in Nanking, China

"Communications" *Buys of the Month*

EXTRA SPECIALS

.1—.1 mfd. 7,000 VDC G. E. pyr. condenser.............. $2.00
In lots of 50.......... 1.75

10-10-10 mfd. G. E. Synchro capacitor 90 V. 60 Cycles 110 V. 60 cycle transformers for plate and filament 570 V ct. 60 ma—5 and 6.3v. black metal case. $1.89

6 henry choke—60 ma., to match above........ $.65

Visors for 5 inch scopes... $.75

Helmholtz phase shifting coils.................. $2.25

Earphone Cushions to fit any light weight set, pair.... .49

Tube shields for 2AP1... .98

Johnson transmitting condenser type 500D35.35-500 mmf. 08" spacing, 3500 V. (list $11.75) $4.75

Power transformer 115V/60c., 3200 V. NCT @ 150 ma....$7.25

BC-221 Freq. meter 125 to 20,000 KC—Extremely accurate for calibrating transmitting and receiving equipment...........$69.50

Headphones, leather covered band 8,000 impedance, with 6 ft. cord and detachable rubber cushions, new.............$2.50
Used in good condition.....$1.50

IF Xtal filter for BC312 or BC342 resonant at 470 KC CRYSTAL INCLUDED...$6.95

B-29 computer amplifier Contains 8 6SN7s, 6X5, 5 neons, 8 relays, completely wired with all components. Designed for remotely controlled guns.....$9.95

Low Voltage Power supply for AN/APS-10 includes 3 6X5s, 1 9006, 6 chokes, 1 power transformer and filter condensers$4.50

Silver button mica condensers (Erie/Centralab) 185 mmfd, ea. 5c
Lots of 100...............$4.50

Leach Relay, SPDT 1353, 115V/60c. silver contact 10 amp rating. Easily converted to DPDT..$1.25

SPST relay, 5a, 115v/60c. $1.49

DPST Telephone type relay 1 closed, 1 open, .5 amp @ 50 v., Coil rating, 3.5a (12K ohms) 1,000 VAC...............$1.05

SPST Oxerload and reset relay Kurman—adjustable opens about 30 mils...................$2.95

Broadcast band push button tuning units, with RF coils.....$1.95

RAK—7 Navy Rcvr. 15 to 600 KC 115V/60c. operation AVC-Noise limiter—a u d i o filter-precision vernier tuning, complete with spare parts box, tubes and instruction book. New.$69.95

Mod. Transf. 807 to pr 807's (screen).................. $1.00

Input: Transf. Single Button mike to grid 20:1........$1.00

Output; Transf. 600 ohms to 6 ohms....................$1

2 hy @ 160 ma choke (Made by GR) 2 for.............$1.00
12 hy-12 hy @ 150 ma.....$3.35

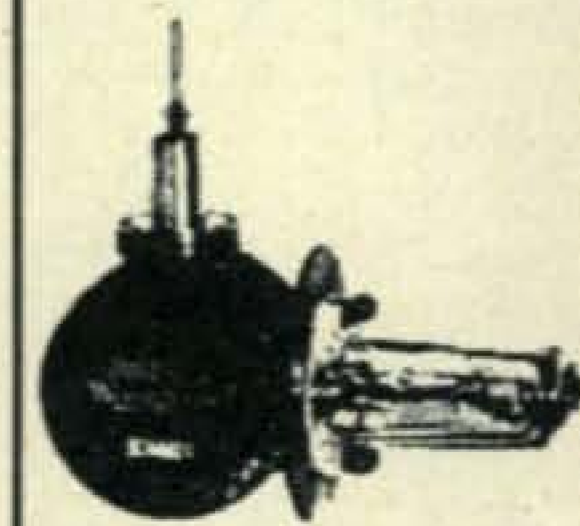
12 hy @ 165 ma. Made by Thordarson...............$1.95

59 hy @ 100 ma. 850 ohms D CR made by Jefferson.........$2.00

MICROWAVES?

Everything From Initiating Pulse to Antenna.

720 MAGNETRON 3CM VALUE $200
SPECIAL PRICE.................. $20.00



2J32 MAGNETRON is designed for 10 cm. operation. Rated at 300 kw peak pulse power. Complete information supplied. Brand new. The 2J32 is listed at $200. OUR PRICE........$25.00

3J31's One cm. magnetron listed at $95.00. OUR PRICE...$20.00

Magnets for either magnetron..........................$12.00

2J38 MAGNETRON (3245-3263 MCS). Complete with Magnet....................$37.50

KLYSTRON oscillator tubes 2K25/723ab designed for 3 cm. operation. New. With complete data. Listed at $38.00............$ 7.75

Duplexer using 1B24 ....$10.00

30 mc oscillator-amplifier with 2 6AC7's. Uses 723ab, Waveguide input, xtal detector. With 6AC7's...........................$10.00

With 6AC7's, 723ao and IN21..........$16.50

Thermistor Beads (D-170396), for use with UHF and Micro-Wave Equipment (List $3.00). In separate sealed containers............$.95

10 cm. Waveguide 16' long. Per foot....$2.00

3 cm. Waveguide 5' lengths. Per foot ..$1.95

SO radar 10 cm antenna assembly COMPLETE, includes drive motor, selsyn, rotating joints, waveguide input, dipole antenna, parabolic reflector. New..................$90.00

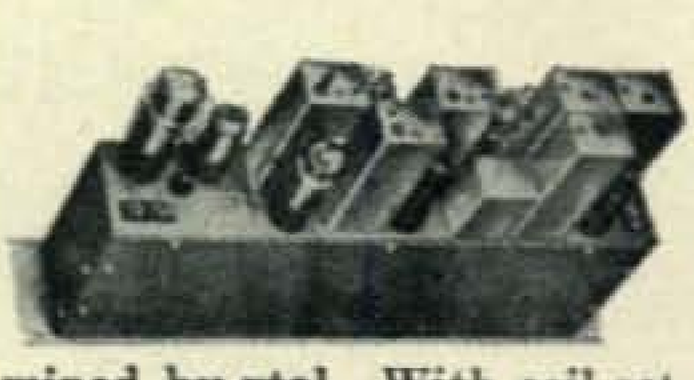
Used in good condition...............$45.00

Transmitter for SO Radar includes magnetron, magnet tr. box, all microwave plumbing, all tubes. Klystron. I.F. strip included, used—in good condition.................Unit $150.00

Signal Generator-2700 to 3000 Mc. Regulated power supply—115V/60c. Contains output meter. Made by Western Electric. Value $400. Our Price......................$75.00

Hook into Your House Current 110 Volt AC input, 12 volt DC output, handles 250 watts. Clean new factory construction. Gray ventilated Metal Cabinet. Swell for Aircraft Radio Units **$34.00**

CW-3 RELAY RACK RCVR



This superhet receiver will operate on any fixed frequency from 1900kc to 16,500 kc. Uses 7 tubes. Operating frequency is determined by xtal. With coil set for 9.4 to 16MC and crystal **$21.50**

Additional coil set 5.6 to 10 Mc. extra $3.00

All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City. Send Money Order or Check. Shipping charges only sent C.O.D.

Ask For Our Latest Catalog

COMMUNICATIONS EQUIPMENT CO.

131-Q Liberty St., New York City 7,
WHITEHALL 4-7658 N. Y.

Under-water Sound Detector

Ideal for detecting underwater sounds, such as fish swimming in schools, within a 15 mile area. Using a Rochelle salt crystal, which is about 1000 times more sensitive than quartz, as the active unit the sound is transmitted up a 60 ft. length of cable. It is completely enclosed in a solid rubber sheath. This sound detector was originally used in harbor defense. Coupled to an audio amplifier, this can be found to have many valuable applications. Ask for SD-1.........$6.95

OIL FILLED CONDENSERS

G.E., C-D, W.E., and other well-known brands

1 mf 300 vdc	$.25	3 mf 600 vdc pyr	$.65
2 mf 300 vdc	.30	4 mf 600 vdc pyr	.70
4 mf 300 vdc	.35	6 mf 600 vdc pyr	.95
4 mf 400 vdc	.55	8-8 mf 600 vdc...	1.49
5-5 mf 400 vdc	1.15	15 mf 220 ac/600 dc	1.75
2 mf 550 vdc	.30	1 mf 1000 vdc...	.85
.25 mf 600 vdc	.25	2 mf 1000 vdc...	.98
.85 mf 600 vdc	.30	1 mf 1500 vdc...	1.05
1 mf 600 vdc	.35	.4 mf 1500 vdc...	.30
2 mf 600 vdc	.40	2 mf 650 ac/1000	.95

TUBE SPECIALS

3BP1	$3.95	837	$ 1.35
3FP7	2.98	872A	2.98
5BP1	4.95	705A	6.75
5BP4	7.95	241B	40.00
5CP1	4.95	861	50.00
5CP7	6.00		
5FP7	3.50		
5JP2	8.95		

Sockets for 5BP1, 5BP4, 5CP1, 3BP1 and similar types 95c

ARC-5 superhet receivers. New in original cartons, tubes included —12SK7, 1-12KA, 1-12SR7, 1-12A6. Schematic thrown in. A different receiver for each of these bands. 1.5 to 3 mc; 3 to 6 mc; 6 to 9.1 mc; and 190 Kc to 550Kc; any one receiver. Specify frequency .... **$12.**

Extra to go with ARC—5:
Dynamotor............. $2.25
Control box............. 1.00
Drive cable............. 2.50
Rack and mounts......... 1.00

NEW POWER SUPPLY

for LM-18 freq. meter. Output: 290v. @ 20 ma; 13 v @ 600 ma. Input: 105-125 v. @ 60 cps; 260 ma; 27.6 W. type 84 rectifier tube; shock mounted. Complete with input and output plugs, tube included... **$14.75** it would prove of interest to all of you. Here 'tis.

Dear Herb:

Enclosed are a series of photographs of XU6GRL which you may use as you please. Rig here needs no explanation as you are familiar with all components.

The antenna set-up is one reversible rhombic to the United States, 350 feet on a side and 67 feet high on spliced bamboo poles. There is also a similar rhombic to Europe, 250 feet per side and 36 feet high, also reversible. Two other antennas (2 half waves in phase of 10 meters and 2 half waves in phase on 20 meters aimed broadside directly east and west) comprise the antenna farm here.

I have worked nearly one thousand stations to date, most of which are in the United States. Conditions for reception here are exceedingly poor due to commercial and government stations working in the amateur bands, particularly on 40 and 20 meters, with key clicks, spurious emissions, harmonics and self-excited unfiltered rigs giving me a bad time. A great number of these stations are right here in the city of Nanking and one station with about one hundred transmitters is within half a mile.

I have worked all districts of the U. S. on 40, 20 and 10 and hope to give the boys a good run in the contest. It is certainly a novel experience working on this end of the DX line. It is more fun to sit here and pick them off than to be on your side of the water calling my head off trying to raise some one. I am trying to give as many stations as possible their WAC where an Asia contact is needed and I am surprised at the great number to whom I am furnishing their first.

To date, I have sent out a thousand cards but have received only forty—some dividends!! The boys are more than lax in sending their cards. Would appreciate your making the address out here clear to them:

XU6GRL
Dr. Charles E. Stuart
International Department
Ministry of Information
Nanking—China

Phone Gossip

W6PDB worked *VQ8AB* in Mauritius . . . 14, 340, and *VQ1DT* in Nyasaland . . . 14,310. W6PDB was the first "W" QSO for each. We don't quite get the prefix VQ1 as ZD6 is supposedly the correct one for Nyasaland. Who knows . . . maybe a change has been made. Other recent good ones for PDB are: *UA1AB* and *VQ4ERR*.

W1JCX has 36Z and 91C. In working *W7IMW/C7*, he said he was in Tientsin, China, and for QSLing purposes, as follows:

W7IMW/C7, Det. 44, % 1st Marine Division Headquarters, % FPO S.F.

W2PKD puts in his two bits worth in favor of the WAZ system. He mentions W2GX as having made seven "one day" WACs in about five weeks time. Meaning, that nowadays it seems relatively simple to work all continents. Incidentally, W2GX is using a converted Collins ART-13, and a 3-element beam on 10 meters. W4CYU has 33Z and 104C post-war, all two way phone, of course. That's what we are talking about now . . . phone to phone contacts. That's what it takes to get in the phone section of the zone and country Honor Roll. Bob was out here last summer for a visit, and we had a little chat. He believes, as we do, that the DX gang is usually a darn good bunch of fellows, and, therefore, it shouldn't be necessary to require confirmations, *except* when a man claims 40 zones. Then, of course, he has to submit all cards, or some form of confirmation. Bob puts a slant on it which is not often considered by some of the boys, and I think it very interesting. He says, in effect, that this QSL buisness can be quite irritating. For example, you work a DX station, and you have a good QSO, and when finished, you feel like you had some fun. Now then, if this same guy doesn't happen to send you a card, you wind up being sore at him. In other words, he thinks there is too much of a premium put on receiving a card. Of course, all of you won't agree with this, but Ham radio, essentially, is supposed to be fun. Bob would like to see not too much restriction on this DX business, and let's all get out there and work the stuff for the fun of it.

W8BIQ is doing some good work, and has made quite a number of 10-meter phone WACs lately. He has 31Z and 69C, all on 10. W2NSD has 28Z and 64C, and one of his latest worked on 20 meter phone should be interesting to some of you. He is:

OI2KAF, P.O. Box 101, Helsinki, Finland

His real call is OH2QM, but, apparently, he is using this OI call on a special deal, because he is leaving for New York, and then to Brazil on a Solar Eclipse Expedition. More QTHs:

W6ONP/KW6, % P.A.A., Wake Island
CT1UU, % ARRL (near Lisbon)
CT2AB, APO 406, % P.M. New York City
W5IBE/J5, Itazuke Army Air Base, APO 929, % P.M. San Francisco, Calif.
KA1ABA, 557 Signal Co., APO 900, % P.M. San Francisco, Calif.
KA1AK, Hq. 13 Airforce, APO 719, % P.M. San Francisco, Calif.
OA4AK, % PAA, Lima, Peru
ON4FN, P.O. Box 634, Brussels, Belgium
VE8NM, Fort Smith, N.W.T., Canada
VSI3, Crane, 1103-4, APO 845, % P.M. Miami, Florida (So. Caicos Island, Bahamas)

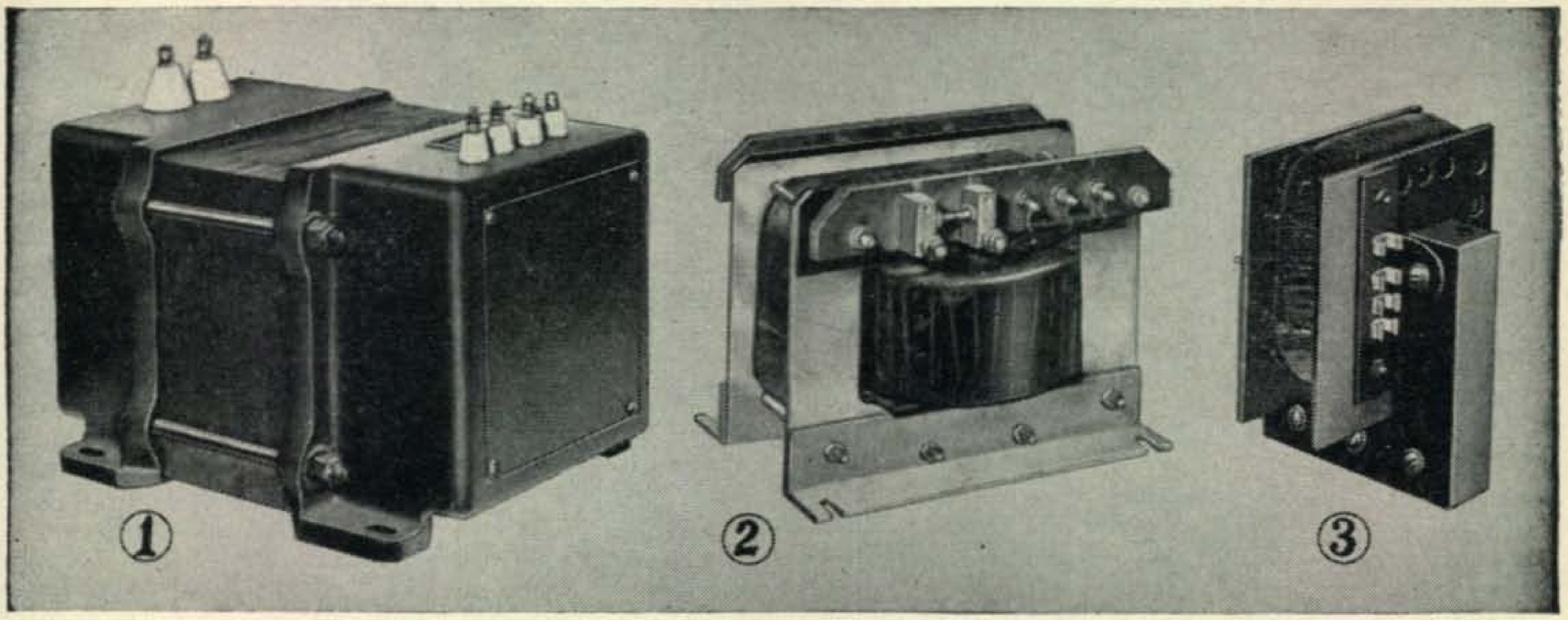
Fellows, when you send in your list for entering the zone and country Honor Roll, please type it, if possible, and I believe it would help considerably if you would list the countries in alphabetical order, followed by the call of the station worked, then by the date and time. This has been mentioned previously in the column, but thought it worthwhile to repeat just in case you missed it up forward. If we can standardize the list coming into us, it will certainly take a little pressure off in compiling the various totals, as well as checking the lists. We do not have enough *complete* lists just now to make it worthwhile to start the Honor Roll. Some of you have simply sent in a card or a letter stating only the number of zones and countries you have worked. Again, let me say, we must have a *complete list* before you can be entered. Try to do that little thing. Will you?

It looks to me like practically all of our gang who get on the air fairly consistently work about the same DX. In view of this, there seems to be little point in listing the DX stations worked by the boys, because it would actually boil down to about the same list of stations. When the new ones, or rare pop up, I think we should then give as much information on them as possible. I wonder if you agree with me. But here is something I would like to get from you fellows . . . try to obtain photos of some of these foreign DX stations. I'm sure the rest of the gang would like to see them in print. As far as news for the column is concerned, I believe all of you would like to read interesting incidents that involve any of our DX gang, whether it be amusing or serious. I think this kind of material is actually better reading than looking at the same lists of DX stations worked by everyone. Before you send in some little bit of news, ask yourself if you think the rest of the gang would be interested in reading it. Don't forget, this is your column.

Activity at QD has not been too great, in spite of a pretty darn decent antenna system. The reasons are contained at the beginning of the column, where I blew off a little steam. One of these days, I hope to be able to duck out from behind my iron curtain and really work a few post-war zones and countries, and . . . of course . . . a few W9s. too. 73.

TRANSFORMERS

From Wells' Great Stock of Selected Government Radio Equipment



1. Amertran Plate Supply Transformer. 2KVA, 6200 volt C. T. 700 mils. Primary tapped for 105, 115, 125 volt 60 cycle operation. There's plenty of power here for the largest amateur transmitter and is priced remarkably low for a unit of this quality—only $34.50 F. O. B., Chicago.

2. R. C. A. 1 K. W. Modulation Transformer for class B operation. The primary, rated at 500 audio watts, matches any class B tube.

	Impedance Ratio	*Turns Ratio*
Primary to secondary #1	1:1	1:1
Primary to secondary #2	25:1	5:1
Primary to secondary #2 tap	625:1	25:1

Built to highest standards and fully guaranteed—price only $16.50 F. O. B., Chicago.

3. Western Electric open frame Filament Transformer 5 volts C. T. at 25 amperes. Primary tapped for 105, 115, and 125 volt operation. 25,000 volt insulation with ½ inch air gap between primary and secondary. At our low price, we suggest that you order an extra one for future use. Price only $3.75 F. O. B., Chicago.

It takes power to punch through the QRM. Check the ratings, quality and prices on these transformers. Even if your equipment budget is modest, you can now go ahead with that kilowatt you've been planning.

We have all the associated equipment, too. Tubes, sockets, high voltage filters, coils, rheostats, voltage dividers, terminal strips, relays, switches are just a few of the hundreds of items in stock—all priced to save you money. Write for Catalog H 200A.

Send for Special Transformer List No. 105

Watch for the Wells Display at Your Jobbers

WELLS SALES, INC.

320 N. LaSalle St., Dept. C-4
Chicago 10, Illinois

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

by Vince Dawson, Jr., WØZJB*

VK4HR was heard by W7ACS/KH6, a distance of approximately 3350 miles, on March 2nd, at 3:28 p.m. HST. W7ACS/KH6 has been heard three times by VK4HR during the week of February 23rd, KH6DW heard J9AAK on February 26th at 4:30 p.m. HST. W4IUJ and W4GJO worked OA4AE in Lima, Peru from 1513 to 1540 on March 23rd. All this on 50 mc!

Now that the famous contact on 50 mc between J9AAK-KH6DD and W7ACS/KH6 has made a new record for that band—4597 statute miles calculated from each of their respective Latitudes and Longitudes—lets look forward to more of them, especially in the Pacific area. A more complete story from both sides of this contact is contained elsewhere in this issue, as a featured article.

In the feature story is a graph that should be of interest to all who plan to make 50-mc DX a reality. The graph uses 29 mc as a reference, so that all you have to do is tune around that vicinity and note the distance between you and the station you are receiving via *F-2* skip. The MUF can then be calculated in that direction. Those of you who use this graph in checks of the MUF please drop us a line regarding its value, in order that we may make future predictions.

All of you that were in on last summer's session of sporadic-E (*Es*) skip noted how signals were never as loud or consistent as in 1938-9, yet there were more openings of a longer skip nature. Very few contacts were made under 500 miles, which did happen on 56 mc, but there were more of the double hop variety (*Es*), from W6-W1 and Arizona to the east. This coming summer's openings starting in April, and continuing up to October should give us a much better chance of trying to actually predict what is in store for us, during the peak of the DX cycle for the next several years.

Ray Bloemer, W6QG, in Santa Ana, California and Perry Ferrell in Philadelphia are keeping a close watch on the in-between spectrum of 30 to 50 mc and would like to get others to send their reports in the MUF each day. Those interested send them to us and we shall get them on to Perry and Ray.

During February, Ray, W6QG found the MUF reaching a peak on the 11th when NUBP on c.w., 47.9 mc was heard for 55 minutes. Ray also monitors WGTR on 44.3 mc daily and as they start to fade down, the MUF shows an upward increase. These stations always build back up around noon, pacific time. In Philly, Perry Ferrell found conditions best on Feb. 15th. Video was heard on 45.6 mc and 47 mc but nothing on 50 mc, all this taking place around 0700 to 1200 EST. Foreign FM is now on the old band of 40-50 mc according to reports from Major Armstrong. Perry has heard several on 41.6 mc and 41.1 mc but could not identify the language being spoken.

Both of the above fellows mention the aircraft beacon stations, between 30 and 50 mc that have a thousand cycle tone on the carrier which is broken periodically and a call sign given in MCW. Although we have tried to find the locations of these beacons no one seems to have them spotted, however Larry, W2IOP, has located these:

UK	34.9 mc	Bristol, England
GED	36.6 "	Croydon
HV	34.8 "	Hurn
HW	36.6 "	Heathrow (London Airport)
AM	35.2 "	Aldermaston
PI	36.6 "	Prestwick

Practically all of those mentioned above have been reported to us. If and when we can complete the list it will be of great value to determine to what part of the world the MUF is open to.

International Notes

According to CRPL-D30, Basic Radio Propagation Predictions worked out by our Propagation Editor, the boys on Okinawa should have good 50-mc openings to Wake Island and Palmyra Island in March, daily, between 0900 and 1700, Okinawa time. The peak being *57 mc* from 1400-1500. April openings to the same locations should occur around the same time mentioned above, tapering off at 1600, the peak being around 54 mc between 1100-1200. May conditions are lower with the peak of 54 mc at 1300, the openings commencing at 1100 to 1500. These same predictions are applicable to the path from Okinawa Shima to Calcutta, India by displacement of the time scale 2½ to 3½ hours later in the local day.

The path from Okinawa to Hawaii shows March

W7QLZ, mobile — Buck Horn Canyon, Arizona

**B St., Gashland, Mo.*

HARRISON HAS IT! HARRISON HAS IT!

A WHOLE NEW BUILDING

So we may serve you even more efficiently!

Yep!—we've just added an entire five story building to enlarge our present facilities. More space to display all the fine lines we distribute—more room in which you can shop in comfort—a sparkling new Harrison Select Surplus section—a real Ham Shack where you can meet with the gang—a bigger and better Bargain Counter—larger and more complete stockrooms.

A streamlined Order Department that will get us back to our pre-war speed of *4 Hour Mail Order Shipments*—A special Export Department to expeditiously handle the orders from our good friends in other parts of the world—

And many more new features—all designed to better enable us to give the friendly service and superior value that have made Harrison's *the* Ham Headquarters—since 1925!

Business going on as (or even better than) usual during alterations. Drop in now and you'll pick up some exceptional bargains during our E-X-P-A-N-S-I-O-N SALE!

73

Bil Harrison, W2AVA

HARRISON SELECT SURPLUS.

SIGNAL CORPS EQUIPMENT

Here are some exceptional bargains in AAF gear that are easily adapted to efficient Ham use.

There are lots of these used units around, but we believe we have been discriminating enough to be able to offer you the very best ones! Carefully reconditioned, checked, and crated to come to you in almost new condition—yet our prices are no higher! Order yours from Harrison—in a hurry—and you'll be happy.

SCR-522 VHF Transmitter-Receiver. Complete with 17 tubes, control box, dynamotor, crystals, etc. $39.95

SCR-274-N. THREE Receivers, TWO Transmitters, controls, antenna unit, dynamotors, 29 tubes, etc. 39.00

BC-375-E Transmitters. Complete with tubes, tuning units, antenna tuner, dynamotor, etc. 35.00

BC-348 Receivers. Complete with tubes, crystal filter, dynamotor, etc., less speaker. 49.50

BC-221 Frequency Standard. Complete with original crystal and calibration chart, and tubes, in cabinet 39.50

RG-8/U Coaxial Cable

52 ohm. FB for feeding beams, etc. Handle a KW. New, perfect cables 110 feet long with two PL-259 coaxial plugs. Total list price is $39.28
HSS Special $4.98

DYNAMOTOR—Delivers 500 volts at 160 MA from 6 or 12 DC. From PE-103 Pack. Brand new $5.75

KW MODULATION TRANSFORMER

Here's the one the're all talking about! RCA broadcast quality. 550 Watt conservative audio rating. 1 to 1 ratio will match most any tubes. Screen winding. Safety flash-over gaps. 38¼ lbs. $14.75

Get ready for Summer fun ON 2

Abbott TR-4B Transmitter-Receiver. Complete with tubes $56.78
Abbott 110 V AC power pack 22.50
EL 6 Volt Vibrator pack 14.97
EL Combination 110 AC/6 V DC input. Delivers 300 Volts DC at 100 Ma, 6.3 at 4.75A. 27.00

HAMMARLUND FS-135-C

Crystal controlled frequency standard. Easily connected—zero beat with WWV—and your receiver is an FB Freq. Meter! Complete unit with crystal, tube, and simple instructions ... $14.25

MILLEN R-9 er

Hop up your receiver with this new antenna matching preamplifier! 27-32 Mc ....

$24.75

48-55 Mc plug-in inductor ... $3.15
13-15 Mc plug-in inductor ... $3.15
6AK5 Tube $3.36

New! Sonar VFX-680

NBFM-ECO "Rubber Xtal"—Exciter Unit $87.45

Harrison Has It!

New 1947 Meissner SIGNAL SHIFTER

Complete for all band operation $120.00

As Authorized Distributors of

COLLINS

Receivers & Transmitters

we are now entering orders for earliest delivery.

Literature upon request

ABBOTT BM - 2 FIVE ELEMENT BEAM

Cut down QRM! Squirt your sigs where you want 'em! Aluminum Elements, 75" boom.

Accurately machined kit, complete with instructions and all necessary parts. List $23.50
A HARRISON SPECIAL $8.82

MECK T-60 TRANSMITTER

Compact! 15"x11"x9" metal cabinet contains complete 60 watt input phone-CW Xmitter. 110 Volt AC. With all tubes and 10 meter coils, less only microphone and crystal $150.00

COMMUNICATION RECEIVERS—
AMATEUR TRANSMITTERS
TEST EQUIPMENT—

All Makes — All Models

Harrison has the biggest and most complete stock! Lowest Prices! Top Trade-in allowances!

HAM HEADQUARTERS *Since...* 1925!

HARRISON RADIO CORPORATION

11 WEST BROADWAY • NEW YORK CITY 7

PHONE—BArclay 7-9854 • EXPORT DEPT.—CABLE—"HARRISORAD"

[JAMAICA BRANCH—172-31 Hillside Ave.—REpublic 9-4102] to be good daily from 0800-1300, Okinawa time. The peak being 54 mc between 1000-1100. April should be good from 1100-1200 when the peak reaches 50-mc flat. May path shows it to be rather quiet, the MUF not quite reaching 50 mc.

From the British Short Wave Magazine we see that ZB2A is on 58 mc looking for DX along with PAØRA, now active in the evenings.

KA1CB is on 50,898 kc with a 3-element beam and 500 watts. The receiver is an SX-36, according to W7ERA who worked him on 28 mc.

Here is a good one for this next session of *Es* come summer. Jerry Grant, VE1QY, in Yarmouth, N.S. is now on 50,580 kc with 100 watts to a pair of 807s, into a 3-element beam. The converter lineup is a 6AK5 r.f., 6AK5 mixer, and 6C5 osc.

In Calgary, VE6HQ is trying to get others interested in the band and has just finished his rig with 6L6, 6L6, 807 final.

John Pavey, VE2KH in Montreal says that interest is very slowly developing around him and so far his best DX is to Valois, Quebec about 10 miles. John gives the following as active there on six; VE2FK, VE2GT, VE2AN, VE2KH and these on 144 mc; VE2AX, VE2FO and VE2GN. Most of the fellows can work cross-band so that at times they have a grand jamboree with 10, 6 and 2 all active.

Round-tables are held on 6 in the Montreal vicinity each Monday at 2230 local time, and on other evenings a few of the boys get together around 2130. They would like more to join them, especially some of you a little distance away.

50 mc Openings

On Jan. 24th things started happening for the boys up north, when the northern lights began acting up. From 2300 CST til 0900 the next day they worked 'em on aurora.

WØDZM hooked WØIFB and W9QUV before midnight, and had three more contacts with IFB early in the morning. An FM-BC sta on 45 mc was still good at 0900 but neither WØQIN or WØDZM found any other sigs. What—ZHB in bed!!

On Jan. 25th at 2130 CST the 45-mc FM popped in again and WØIFB was worked until 2200. W9PK was heard at ØDZM and W9DWU had a nice QSO with Jack, W9PK.

Feb. 14th, WØHXY in Anoka, Minn. heard a W8 calling CQ Six at 2236 CST but was unable to contact him.

On the morning of Feb. 16th WØQIN worked WØUSI, in Brookings, S.D. with WØDZM getting in a chat with ØUSI also. Things were quite normal around 1930 CST, when WØHXY's "aurora gismo", started hopping, which started a scramble and some fun. WØHXY had a contact with W9ZHB and heard W9PK, WØDZM got WØIFB, WØQIN worked W9PK and WØIFB was heard up to 2130, which wound up the nights farray. During the above aurora openings sigs were found to be best with antennas at 30 degrees.

50-MC DX HONOR ROLL

Calls	States	Districts	Other
W9ZHB	28	10	VE3
W1LLL	27	10	
WØZJB	27	10	VE3-4
W1HDQ	25	9	G5-6*
W1PFJ	25	9	
WØYUQ	22	10	VE3
W9PK	21	9	
WØDZM	20	10	VE3
WØSV	19	9	
W3RUE	16	9	
W2IDZ	17	7	
W8SLU	14	10	
WØJCQ	13	10	
W6NAW	13	8	VE7
W1JLK	12	5	
W9ALU	7	6	
W7ERA	5	3	
W7HEA	4	3	
W7JPA	3	2	
W6WNN	3	2	
W7BOC	2	2	
W7CTY	1	1	

**Cross-band.*

Eager Beaver Net Loses WØJCQ

Fate has dealt the Eager Beaver Net a cruel blow. WØJCQ who is a Warrant Officer in the Signal Corp, RA, has been transferred to J2 land. Bill has been our "W1LLL" of the Net, in that he was always on and chasing those dead carriers that seem to haunt us here in the west.

Wednesday night, Feb. 20th was farewell night to Bill on 50 mc and after signing with us, he and WØYUQ went to 144 mc for their last good-bye. The boys really had a time getting over the 500 ft. range of hills between them and had spent considerable effort putting up a square corner array at JCQ and a 12-element tier at YUQ. This naturally had to come down at JCQ leaving YUQ alone in this vast frequency spectrum. Well as the story goes, this last good bye was very pathetic and the signals coming at JCQ from YUQ were literally flooding JCQ's shack, the tears from YUQ's signal being so wet. All this pathetic scene was being taken in by JCQ's XYL, Jane, who promptly set down and wrote this Lament;

THE SAD PARTING OF 2 Q's ON TWO!!

"Farewell on Two", said YUQ
"Goodby on Two", said JCQ
"It's been grand, but now it's over"
That's YUQ
"We were really in clover"
That's JCQ
"It was wonderful while it lasted,
now our 2 meter hopes are blasted!
Said YUQ
"I'm on my way to J2 land,
where I can work you on any band,
But *2*—be seeing you on six", some DX
Said JCQ

50-mc Gang

Never has the 50-mc gang gone so long with a "dry spell". The last *Es* opening in the east was on Dec. 22, and in the west on Jan. 4th. The boys in Minn. have been in on some aurora skip, working into Ill. and Ia., but this is confined to a specific area.

Remember Scotty, W2LadsAndLassies in W. Englewood, N.J., from the ole 5-meter days? Well he is now back at the old stand again on 50.2 mc and for the present using a 2-element indoor beam.

Bud Keller, W7QAP, has moved his rig to the new QTH and is back on with an 815 in the final. Bud will have a 12-element H array up for this summer's activity.

Six-meter activity is picking up lately in New Jersey according to W2IDZ of Whippany. Ed now has 17 states and says the Union County Radio Ass'n has officially adopted the 50-mc band to hold meetings once a week. If this were done by more clubs it would increase activity a lot.

The Hermit of Buck Horn Canyon, namely W7QLZ is now trapping for a living and has taken his mobile rig along to get the game with, the game no doubt being equipped with walkie-talkies we hear so much about. Clyde's rig uses a 6AK7 xtal, 7C5 and 832 final with 15 watts input and is very universal being built to cover any freq from 28 mc to 160 mc. The coils and condenser for each band plug in together.

Poncho, W6WNN in LaMesa says that 50 mc is dead although sigs up to 42 mc have been heard recently. On the last full moon not even the LA gang were heard on six. He would like skeds with stations in Yuma or other parts of Arizona as it is only 300 miles from him. Any interested takers?

A letter from Lightning, WØEET says there are four stations now active in the St. Louis area and nice round tables are had each evening, with an evil eye kept out for signs of DX.

New stations are getting on in the Upper Miss Valley Net, with WØQHC in Minneapolis, WØOPA in Bald Eagle Lake and WØJJJ in the Twin-City area.

WØYSJ in Fargo, N. Dakota is now on 50,050 kc, with 200 watts to a 4-element beam and a Gonset converter ahead of an HRO.

Shorty at WØDZM says he rates the lowest power WACA, having gotten it and 20 states with 30 watts input. The antenna is a single Bi-Square, rotatable, with a new one in a fixed NW-SE position of 3 Bi-Squares stacked. The top one is 70 ft high and checks show a 6 db gain at St. Cloud, 45 mi.

Bish, W7HEA, the reporter from the "Sad Sack Net", says that W7CAM is on with 100 watts and a 4-element beam, and that W7s CTY, AWX, BOC and others are now using the 3-element ¼-wave spaced beam, with FD radiator designed by WØ-YUQ. It will be described in a coming issue of CQ, as a featured story. W7IOS in Grandview has just joined the net, so they have another convert.

Here's a report from W2 land, the first in many moons and comes from the ole "Spring Station," W2AMJ, Frank Lester. Frank has been having consistent schedules with W2GYV in Schenectady. A look at a map will show this is no easy haul as it is very mountainous territory between the two stations. Nevertheless since the boys back east have gone horizontal, they are making the hop regularly. In the ole days with verticals, the hop was only made when aurora was present. Both Jeff and Frank are using 4-element beams and Jeff's is in his attic at that! The distance is 148 miles, with the power at both ends of 400 watts. One night with 2AMJ's antenna completely covered with ice and snow condx were good on phone, with daylight skeds proving good on c.w., but with some QSB.

W2GYV has also worked W3CIR/1 Boston, W1PFJ Waltham, W1HDQ W. Hartford, W1LLL Plain, Hartford, W1AEP Springfield and W2EUI Roselle, N. J. also made the hop.

Back up to Minnesota at St. Paul we find WØ-ORA with a brand new 1 kw which he is anxious to try out.

144-mc Epics

On Tues. night, Feb. 25, WØDDX near Independence, Mo. heard WØYUQ's 144-mc sigs S-2, a distance of 125 mi. The receiver at DDX is a converted ARC/3 and a 4-element horizontal beam with 4-wire doublet radiator. YUQ was unable to hear Roscoe (DDX) in Manhattan, (Kansas that is), possibly because DDX's voice went up into the dog whistle range with excitement. The antenna at WØYUQ is an elaborate affair, consisting of 4 three-element beams stacked two above and the other spaced to the side, similar to an H with reflectors and directors. YUQ's rig is 25 watts input to a 832. Let's hope this is the start of some good long hauls here in the heart of America. This proves it can be done!

In the San Diego area with Poncho, at W6WNN reporting, these stations are active; W6NKM, W6MXK, W6VON, W6RTX, W6KD, W3UUX/6, W6BOS and W6WNN. Poncho says this isn't bad as 6 meters is dead as a mackerel, until the summers DX starts.

Hod, W9ALU in Metamora, Ill has worked 80 mi to W9WCD at Kekalb and adds that W9ZHB now runs 300 watts to VT-127As, and for the rest of the 144-mc gang to watch out as Ed is gunning after the first Sporadic-E opening on the band. Hod skeds W9RGH, W9BHT and W9ZHB nightly, with ZHB always running 96 db. The transmitter at W9ALU is a BC-525 and 3-element horizontal.

Herb Johnson, ex-W8QKI, now W3QKI, is on 144 mc in Erie, Pa and says that several others are ready to joun him in working W8UKS. Herb says these schedules are fb every night, loud enough to be recorded and played back over the 102 mi path. On an average nite the Ohio boys can copy him with 3 watts input, and to prove it they have recorded him and played it back. The antenna is very fancy, being a lazy H backed up by a screen reflector. On one side is a vertical H and on the other a horizontal one. The array is 30′ at present.

Another, active in the Erie area is W8NBV, on 145 mc with 50 watts to an 815. So far only a vertical is used but a 24-element job is going up to contact the Cleveland gang.

Bill Smith, W3GKP in Silver Springs, Md. is now back on 2, having taken the fall and winter off to get some new equipment fired up. He can now run 60 watts to an 829 on either 2 or 6, using the pitchfork antenna on 144 mc and a 3-tube converter with 6AK5s. So far he has 6 states, (NY, NJ, DEL, Pa, Va and Md) on 144 mc and 3 call areas (W2-3-4).

W8UKS has a new vertical beam up and on Feb 14th was able to work W8NBV in Erie, Pa a distance of about 100 mi and W2RGH in Westfield, N. Y. 150 mi. These were spotty contacts and made possible only by good condx. Nightly skeds with W3QKI in Erie on horizontal polarization have been more successful. Transmissions beamed toward Pittsburg and Youngstown have so far brought no results. Won't some of you fellows in those last two cities help Sam out?

For the benefit of the boys in Youngstown and Pittsburgh, Jerry, W8WJC listens for them nightly from 2000-2005 EST. So far no one has been heard but he is a hoping. W8WJC operates on 144.5 mc with 200 watts to a square-corner beam 90′ high!

W8LIO operating week-ends in Andover, Ohio works into Cleveland (65 mi) and to Erie, Pa. He heard some Youngstown boys on the night of Jan 28th at 2245 but was unable to raise them. Jack is on 144,792kc with a square-corner beam on his 70′ tower.

235 mc

W6WNN in LaMesa would like skeds on this band around the San Diego area, those interested please contact him at P.O. Box 363.

425-mc Beacon Station On

W2MWB in Woodhaven, L. I. is operating on 425 mc every Tues night from 2000-2100 EST, tone modulated with station break every 15 mins. He is using a corner reflector on a rotating beam,

[*Continued on page 67*]

The YL's Frequency

by Amelia Black, W1NVP - W2OLB

WHETHER TO LEARN TO BE A HAM or "get another husband for upstairs use" is the problem facing Lou (no call) Daniels of Livingston, New Jersey. Lou's letter puts a new slant on an old problem. "My OM has been a ham since he was about twelve, and now has the call W2IHB. We've been married six-and-a-half years and have a couple of junior ops, two-and-a-half and five-and-a-half. Hamming didn' seem to intrude too much before but since the war is over—WOW! Which is putting it mildly, to say the least.

"The old boy is in the basement shack so much that he has developed jailbird pallor and comes up only to shave and eat—or to change the antenna.

"Since I love the silly geek, I decided I'd better learn enough about hamming to get my own ticket, or else! But I sure do get discouraged at times.

"The OM says it's all very easy, and then comes out with an answer to some question I ask, and I swear that out of the twenty-word explanation, I understand maybe four or five.

"Never had much trouble learning reading and 'rithmetic, but I'm beginning to think I must have a blind spot so far as radio is concerned. Code doesn't bother me, but theory seems to be written in another language.

"My principal interest is to get on the air and chew the rag with YLs, and I am wondering if there is any simpler approach to learning radio than the method I have been following. I have copies of *CQ, QST, The Radio Amateur's Handbook, How to Obtain Your Amateur License*, etc. Still I am befuddled.

"It's all so confusin' and definitely *not* amusing!!"

Ever hear of "Kortvags-Lyssnaren"? It's the "popular tidskrift for radio" with information for both the "kortvagslyssnare" and the "amatorer," published in Stockholm. In other words, Sweden's radio magazine. A friend sent us a copy, and lo and behold, there was "The YL's Frequency" reprinted in Swedish—in the section for "amatorers." Hope to be hearing from Swedish YLs as a result.

While on the subject of YLs from overseas, we were happy to hear from G2YL, Nell Corry, of Petersmead, Walton-on-the-Hill, Tadsworth, Surrey, England. Nell has been one of the most active English YLs since getting her license in 1932. "Until 1939," she writes, "I operated mainly on 28-mc c.w., though I used 14 and 7 mc a bit too and made WAC on all three bands. Tried phone in 1933/34 but

Lenore Conn, W6NAZ

eventually dropped it. Am now active only on ten and five (our band is 58.5-60 mc).

"Run a daily sked on five with Constance Hall, G8LY, 44 miles away, who manages to run an efficient station with no electric mains at all! We both have HRO receivers (hers runs off batteries) but build our own transmitters. Mine is 6J5 co, 807 quadrupler, 807 doubler, and HK24 final; PA on ten and power doubler on five—into a 66-ft. Zepp for ten, and on five, a close-spaced three-element rotary beam. We are limited to 25 watts on five, so my best DX to date is only 175 miles, but am hoping for some European contacts next summer when conditions are better."

Other G-YLs Nell mentioned are Barbara Dunn (a real old-timer), G6YL now active on 80 c.w., and a since-the-war YL G3ACC, Meg Mills of Durbirch, who's on 80 and 160 meters. At least one YL is active in Scotland—J.A.C. Rainie, GM3AKR, of Aye. Also reported back on, is G3YL, Ruth Jebb.

We've heard from Lenore Conn again, who hopes to stay W6NAZ in Los Angeles for a while. Lenore is another YL who really got "hooked up" with a ham when she solicited his help in learning ham radio. That was in Chicago, in '39, where Lenore played a leading role in the radio serial "Don Winslow of the Navy" and her OM, Joe, was sound engineer.

Lenore's been in the theatre since she was a little girl . . . on the stage, in the movies, and on network radio. She's played leads in many radio serials: "Against the Storm" "Honest Abe," "Don Winslow," "Midstream," "Guiding Light," "Bachelor's Children," and "Affairs of Anthony" and has also written several scripts for the CBS station in Washington, D. C. We're really very proud!

Remember we promised to get you a pix of that famous N. H. 73-88 license plate that belongs to W1FTJ? Well, here it is—to prove it! A long letter from Dot reports that she's presently interested in

[*Continued on page 67*]

HAMS! Here's Big News from CONCORD on Communications Receivers!

BC-645 Transmitter-Receiver

Brand-new 15 tube interrogator-transmitter designed for airborn use. 435 to 500 MC frequency range. 5 tube tuned line transmitter with 30 Watts peak-impulse power output on either of two channels. Easily altered for Type A1, A2 or A3 emission. 10 tube fixed freq. super-heterodyne receiver. Receiver range 461-493 MC with 40 MC IF 1MC wide. Sensitivity 10 microvolts. Transmitter range 435-500 MC. Complete with all tubes, including WE Doorknob tube. Size: 10½" x 13½" x 4¾". Net wt. only 14 lb. X5B9552—Your Cost.................. **$16.85**

SCR-522 VHF Transmitter-Receiver

17 tube, 4 channel fixed frequency transmitter and receiver, both crystal controlled. All operations push-button controlled. Freq. range 100-156 MC. Transmitter 15 watts AM voice output. 28 volt DC dynamotor with input and output filters and carbon pyle voltage regulator. The control and jack boxes are small and can be mounted conveniently. Complete with all tubes, dynamotor, control and jack boxes, and necessary connectors. X5B9550—Your Cost...................... **$38.50**

SCR-274-N Aircraft Command Set

29 tubes, 3 receivers, 2 transmitters, RF current indicator and antenna relay, 4 dynamotors, and 25 watt modulator. Separate remote control box for each receiver and transmitter. For CW, MCW, or Phone. Receiver freq. ranges: 190-550 KC, 3-6 MC, and 6-9.1 MC. Transmitter freq. ranges: 3-4 MC and 4-5.3 MC, 50 watts output. Complete with tubes, and connectors, but less wire and flexible shafts. Net wt. 77 lbs. 24-28 volt DC operation. X5B9557—Special........................ **$33.95**

Just Out! **CONCORD** *Bargain Catalog of* **RADIO Equipment** FOR *Immediate Shipment*

CONCORD RADIO CORP.

LAFAYETTE RADIO CORPORATION

CHICAGO 7 ★ **ATLANTA 3**

901 W. Jackson Blvd. 265 Peachtree Street

BC-654 Transmitter-Receiver

13 tubes, brand-new, 3800-5800 KC, Voice and CW, crystal oscillator for frequency check every 200 KC. 7 tube superhet receiver with 455 KC IF. 6 tube variable frequency transmitter with 24.6 watts output on CW, and 11.2 watts output on Voice. Ideal for hams! Complete with cover, set of tubes, 5 spare tubes and 3 spare pilot lights, but less power supply and accessories. Size: 18" x 14" x 9½". Net wt. 44¾ lbs. X5B9553—Your Cost **$28.75**

BC-348 Communications Receiver

6 bands—200-500 KC, and 1.5-18 MC in 5 bands. High sensitivity, 2 stages RF, crystal IF filter, beat frequency oscillator, high-ratio non-backlash geared dial, and output for phones or 500 ohm speaker. Has combined audio and sensitivity control, variable frequency BFO control, IF crystal off-on control, and BFO off-on switch. Built-in 24 volt DC input dynamotor power supply. Complete with tubes and instructions for converting to 110 VAC 60 cyc. operation. Size: 18" x 8⅜" x 10½". XC21005—Your Cost **$49.50**

Air Force Transmitter Set BC-375-E

Designed as aircraft liaison transmitter, and famous for its dependable operation and rugged construction. Frequency range: 200-500 KC, and 1500-12500 KC. Transmitter output 30 to 75 watts. Complete with built-in and external antenna tuning units, 7 plug-in tuning units, 24/28 volt DC input dynamotor, and all necessary connectors. 6 wall mounting metal cases for tuning units included; other tuning unit in transmitter. Wires and cables not furnished. Shpg wt. 400 lbs. Order must be accompanied by 50% deposit. Shipped by freight only. X5B9556—Your Cost **$34.95**

THOUSANDS OF ITEMS! OUTSTANDING VALUES!

Just off the press . . . 48 exciting pages of radio parts, equipment, and supplies . . . a treasure house of radio needs for hams, including new and hard-to-find items . . . plus pages of parts and equipment for servicemen, dealers, engineers . . . for experimenting, testing, maintenance and repair . . . thousands of items *NOW IN STOCK* and ready for *IMMEDIATE SHIPMENT*! Big feature sections of Ham Gear, Communications Receivers, Radio Sets, Amplifiers, Replacement Parts, Record Players and Portables, Record Changers, and complete Sound Systems. Page after page of bargains in top-quality standard-make radio parts and electronic equipment.

Mail Coupon NOW for FREE COPY

Mail coupon below TODAY for your FREE COPY of this latest Concord Buying Guide and Bargain Catalog of Radio needs you can order for SAME DAY SHIPMENT from complete stocks in Chicago and Atlanta.

CONCORD RADIO CORPORATION Dept. CR-37
901 W. Jackson Blvd., Chicago 7, Ill.

Yes, rush FREE COPY of the new Concord Bargain Catalog of Radio Parts.

Name...

Address..

City........................ State...............

Postscripts

Trans-Atlantic reception reports of the London television voice transmitter on 41.5 mc are urgently requested by the Propagation Editor. If you heard the London (announces as Alexandria Palace) transmitter during the past seven months, you are requested to write him in care of this magazine, giving the date and time of your reception. Radio amateur reports of this nature are particularly useful in checking the maximum usable frequency during this phase of the sunspot cycle. This data has been requested by the Engineering Division of the B.B.C.

— • • • —

NORTH SHORE (N. Y.) HAMFEST

The third annual hamfest of the greater New York area since the war will be held on April 10th at Lost Battalion Hall in Queens, New York City under the sponsorship of the North Shore Radio Club of Long Island.

John DiBlasi, W2FX, President of the North Shore Radio Club has promised a hamfest that will surpass even the previous two. Amateurs from New York, New Jersey, and New England who smashed attendance records at the early affairs can vouch for the quality of these hamfests.

Accommodations are available for over 1,500 hams. Top-notch speakers and personalties, demonstration of latest equipment, entertainment, a valuable souvenir program, and door prizes that include two nationally known communications receivers are but the highspots planned.

The time is 8:00 p.m., Thursday April 10th at Lost Battalion Hall, 93-29 Queens Boulevard, Elmhurst, L.I., N.Y. There is ample parking space or take the E 8th Avenue or F 6th Avenue train to Woodhaven Boulevard, Queens. Tickets are $1.50 and are available at radio amateur stores or at the door. In addition North Shore Radio Club members, including W2FX, W2FIT, W2PYY, W2KYX, W2BCB, and W2BT can supply tickets.

— • • • —

Quad-City (Moline, Ill.) Hamfest

The Quad-City Amateur Radio Club is holding a Hamfest April 27, 1947 at the Farmall Club south of Moline, Illinois. The program begins at 10:00 a.m. and there will be games, prizes and equipment demonstration. Tickets are $1.50 and includes refreshments. Tickets are obtainable from H. E. Hermann, Moline, Ill.

— • • • —

KEY CLICKS

Another Method of Converting the ART/13, February 1947, CQ, contains an error in *Fig. 1*. The antenna and hot side of link connections are reversed at the relay.

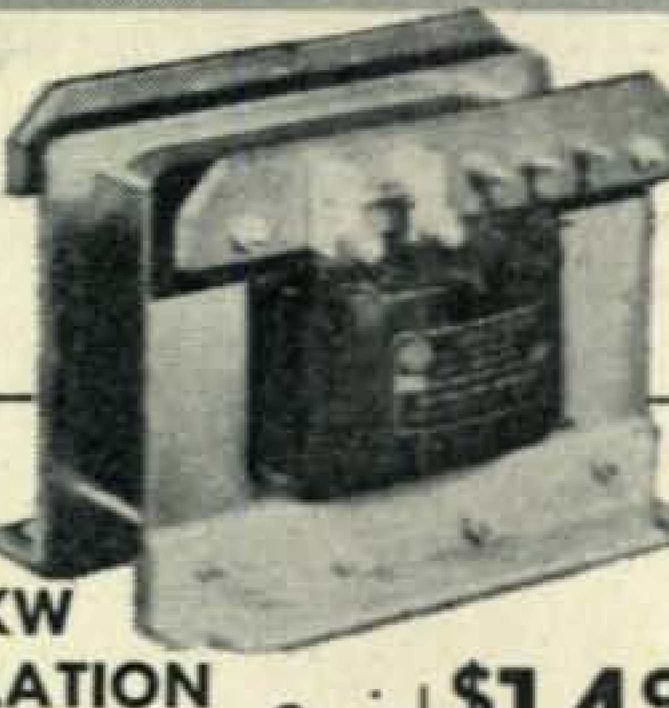
HERSHEL *Offers* BETTER BARGAINS . . . BIGGER BUYS

All Orders F.O.B. Detroit

Minimum Order $2.00

TUNING UNIT

Turning Unit BC 375. Approx. 65 M.M.F.D. cond., coils, RF chokes dials, ass't'd mica condensers 2500 WVDC, over $50.00 in parts. Cat. No. TU-101.......... $3.75



1 KW MODULATION TRANSFORMER

Special at $14.95 — BUY NOW AND SAVE

RCA modulation transformer is conservatively rated at 550 Watt audio to modulate that new KW rig.

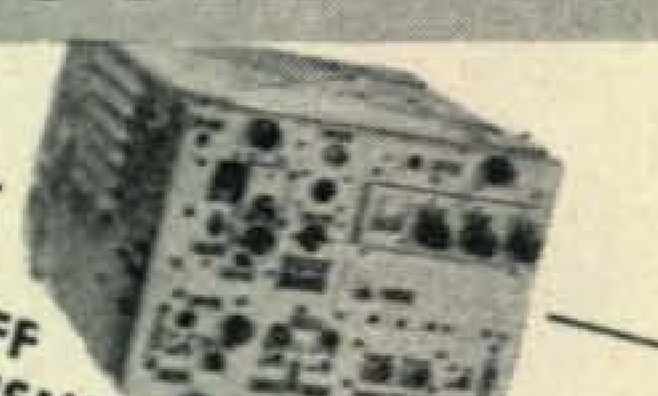
Really rugged construction with protective flashover gaps, which are adjustable. Terminals and gaps are mounted on a "Mycalex" terminal board. The laminations that make up this transformer are of high audio quality and are extremely thin, making it impossible for the core to "chatter or talk."

Audio Watts—550 Sec. #1—450 Mils Sec. #2—80 Mils Turns Ratio—Pri: Sec.# 1-1:1 Pri: Sec. #2-5:1 Pri: Sec. #2 Tap—25:1.

Impedance Ratio—Pri: #1-1:1 Sec. Pri: Sec. #2-25:1 Pri: Sec. #2 Tap—625:1.

DC Resistance—Pri: 135 ohms Sec: #1, 112 ohms; Sec. #2, 99 ohms.

Transformers insulation tested: Pri. 8000V.; Sec. #1-11-000V; Sec. #2-2000V. to the rest of the coils and core. Primary center-tapped for Class "B" modulators. Secondary #2 will carry 80 Mils to modulate screens of beam power or screen grid tubes. Primary will match any Class "B" tubes up to 10,000 ohms plate to plate, such as 810's, 75T's, 8005's, ZB120's, 203's, HY51Z's, 211's, 813's, 828's, 805's, 203Z's. Size 9½" wide, 7½" deep, 7¼" high. Heavy channel iron mounting brackets. Weight approx. 40 lbs. Catalog number MT-100.



BM-IFF TRANSMITTER AND RECEIVER

The famous boat anchor released from Government surplus, has been widely used on the 144 MC band. It can now be used as a transmitter and receiver. Shipping weight 100 lbs. Your price, less tubes and power transformer. Catalog number RT-102.......... $14.95

CONDENSERS

Cat. No.	Cap. MFD.	Working Volts	Your Cost
C110	1	5000 Oil	$3.95
C111	3	4000 Oil	$4.95
C112	1	1000 Oil	44c
C114	8	600 Oil	95c
C115	2	600 Oil	49c

Westinghouse 1 MFD 6000 volts WVDC... $7.95

Westinghouse 1 MFD 10,000 volts WVDC.. $12.95

VARIABLE CONDENSERS

100 MMFD variable APC type, Cat. No. T-21.......... 59c

30 MMFD variable APC type, Cat. No. T-22.......... 25c

12 MMFD variable ¼" shaft, Cat. No. T-23.......... 30c

CHOKES

Thordarson 8 HY 150M choke, Cat. No. FC-201.......... 95c

Thordarson 8 HY 175M choke, Cat. No. FC-202.......... $1.49

Thordarson 12 HY 25M choke, Cat. No. FC-203.......... 39c

Thordarson 8 HY 350M choke, Cat. No. FC-204.......... $4.95

THORDARSON T 48003

2H-7H 550 MA swing choke size 4½ x 5½ x 5½ square black crackle case. Cat. No. FC-205.

$5.95

MICA CAPACITATOR

.002 MFD 3000W VDC. Cat. No. RT-101.......... 49c

IF TRANSFORMER

Mounted in aluminum shield can 1500 KC, with air trimmer, impedance coupled type. Cat. No. T-19.......... 95c

30MC IF TRANSFORMER

In square aluminum can, silver slug tuned. Cat. No. T-20..... 29c

RECEIVER AND TRANSMITTER

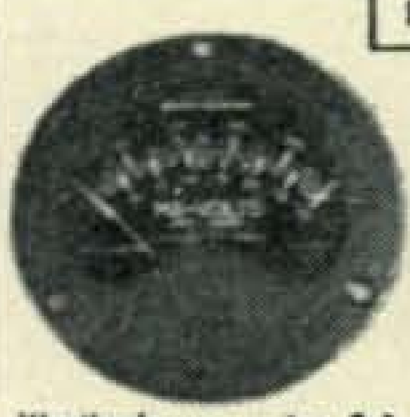
SCR-522. 100-156 MC receiver and transmitter complete with 18 tubes. Used, in good condition. Cat. No. RT-10.......... $29.95

HALLICRAFTER RECEIVER

R45/ARR7—contains xtal filter, variable I.F. selectivity A.V.C. and A.N.L. Osc. patterned after SX28A Hallicrafter, voltage regulator complete with tubes and power supply components for 110V operation. Cat. No. SX28A.......... $139.50

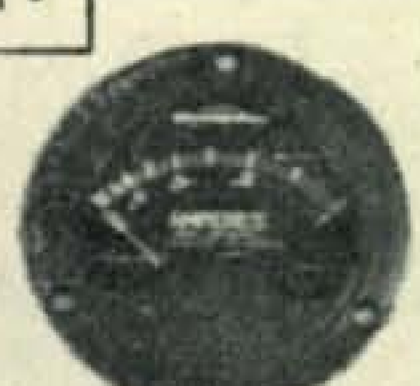
Mich. Sales add 3% Sales Tax

3 LBS. ASST. RADIO HARDWARE $1.00



Westinghouse meter, 0-1 MA movement, 2" round case, scale calibrated 0-140 and 0-500. Includes mounting hardware. Cat. No. M-101. $2.95

Western Electric meter, 4" round, zero center, 0-½ MA each side. Cat. No. M-102. $3.95



Westinghouse meter, 0-1 RF amps, 2" round case, internal thermocouple, in original box. Includes mounting hardware. Cat. No. M-103. $2.95

READRITE 2" SQUARE METER O-5.......... 59c

PIN STRAIGHTENER

For miniature tubes—Gov't cost $4.80 our price—Cat. No. 49c

DYNAMOTOR

Power supply—inputs 6 or 12 V, output 500 VDC at 160 MA, mounted on box with circuit breakers, relays, interference filter and two 10 ft. cables. U. S. Govt. surplus. Cat. No. DM-101. $9.95

SELSYN MOTORS

The ideal way of indicating the position of rotary beams, wind indicator, etc. (400 cycle). Line cord and instructions for 110 VAC operation furnished.—Cat. No. SM-100. 2 for $3.95

Hot Spot Specials

Ass't resisters ½ watt fully insulated, in popular ohmages. Cat. No. R-5—per 100.......... $1.49

Ass't mica condensers, Cat. No. C-12—per 100.......... $1.95

Wafer sockets, 4-5-6-7 and 8 prong. Cat. No. WF-4—per 100.......... $2.95

12" Utah P. M. Speaker, Alnico #5 with 6F6 output transformer. Cat. No. ST-100.......... $6.95

Ass't knobs push on wood and plastic. Cat. No. KP-100—per 100..... $1.95

6J4....... $1.50 6J6.......... 95c

Johnson sockets #210-25W. Cat. No. JS-210.......... 49c

955-9004 tubes. Cat. No. T-99..... 65c

Sockets for acorn tubes. Cat. No. AT-10.......... 19c

8-8 MFD 350 WVDC, 20 MFD 150 WVDC, round can. Cat. No. RC-88...... 69c

Hallicrafter volume knobs—SX 28.. 15c

Pots—screw driver shaft, 2 meg., 1 meg., 150M, 50M, 25M, 5M, 2M, 200 ohm—ea.......... 29c

A 144 MC Radar Osc., uses 15 E or Hy 75. Enclosed silver plated tank with variable coupling. Complete less tube.......... $3.95

Jacks PL 55, PL 68.......... 15c

Powdered iron slug with Isolantite coil form to match, ideal for broad tuning E.C.O.......... 25c

Powderediron ¼ slug.......... 10c

Write for **FREE** *Bulletin*

FILAMENT TRANSFORMERS

Thordarson 6.3 V-4 amps., 6.3 V-4.5 amps., 9.7 V-.5 amp., pri. 110 V AC 25 or 60 cy.—Cat. No. FT-11...... $1.95

Thordarson pri. 110 V 60 cy.—sec. 6.3 V 6 A, CT—Cat. No. FT-12.......... $1.49

Thordarson 110 V 60 cy. pri., sec. #1-2.5 V, 10 A Ct, 3000 V ins., sec. #2 10 V 3.25 A, Two 5 V 3 A; 6.3 V 1 A—Cat. No. FT-13.......... $4.95

SHALLCROSS ACRA-OHM WIRE WOUND RESISTORS

2,000 ohm	25,000 ohm	70,000 ohm
3,300 ohm	30,000 ohm	75,000 ohm
9,000 ohm	50,000 ohm	100,000 ohm
15,000 ohm	60,000 ohm	160,000 ohm
18,000 ohm	65,000 ohm	600,000 ohm

±1W 39c ea. 3 for $1.00

BUTTERFLY CONDENSERS

Ideal for high frequency work.

Type A—frequency range 76 to 300 megacycles to be used with 955 tubes. Cat. No. BC-1.

Type B—frequency range 300 to 1000 megacycles to be used with 368AS door knob tube. Cat. No. BC-2.

95c ea.

BC-375-E GENERAL ELECTRIC MOPA TRANSMITTER

Used as liaison transmitter in bombers and ground stations. Frequency range of 200-500 Kc. and 1,500-12,500 Kc. is covered by means of 7 plug-in tuning units furnished. By slight modification operation on 10 and 20 meters is possible. Oscillator is self-excited temperature compensated type. Power amp. is neutralized class "C" using 211 tube and is equipped with antenna coupling circuit to match practically any antenna. Modulator is class "B" using two 211 tubes. Power supply is 24 V. DC dynamotor which furnishes 1,000 V. at 350 M. A. However, transformer is ideal for construction of 110 V. AC power supply. Transmitter output conservatively rated at 42.5 watts, phone 75 watts CW, but may be pushed to 150 watts. Complete with tubes, dynamotor, seven tuning units, and cable connector plugs. Brand new.......... $49.95

R44/ARR-5 HIGH FREQUENCY

receiver. Patterned after S-36A by Hallicrafters. Receives FM and AM signals in the spectrum between 28 and 145 megacycles. Circuit has 14 tubes including voltage regulator for high frequency oscillator. Has two position selectivity control. Contains no internal power supply. Has acorn tubes RF., Osc., and Mixer. Complete with components for power supply including transformer, choke, filter condensers, and rectifier tube.......... $100.00

HERSHEL RADIO CO.

5249 GRAND RIVER — DETROIT 8, MICHIGAN

20% DEPOSIT REQUIRED ON ALL C. O. D. ORDERS

AMATEUR NEWCOMER

[*from page 56*]

We have a notion that the main trouble is that many candidates have a fear of failure which sets up a barrier to satisfactory performance. To overcome this barrier the candidate must build up a confidence in himself which can only be inspired by the inner knowledge that he has at his command ability in excess of that required.

Two concluding remarks might be appropriate. If you reach a stage at which you seem to make no progress for days or even weeks, do not become discouraged. You are on what is known as a "plateau" of learning. and show no progress for some time. You will then commence to improve again, and perhaps arrive at another plateau. You may pass several such stages before you reach a speed great enough to enable you to take the test. At each plateau, the mind, so to speak, consolidates its gains before pressing onward.

The second remark is that if you know how to type, or have the opportunity to learn the touch system, try to combine it with learning the code. Just be sure you can copy at the necessary speed by hand when you go up for the test.

With this, the matter of learning the code may be left to the individual. It is the one thing you can't learn by doing interesting experiments. Learning code is pure drudgery until you have mastered it sufficiently to enable you to use it. When you have reached this stage you will feel a good deal relieved that all the hours of work have not been in vain.

In code practice, reception preferably should be by means of headphones, although preliminary group instruction often is given over a loudspeaker. The main idea is to simulate, so far as possible, the conditions under which the test will be taken, and the FCC uses headphones rather than the speaker.

For purposes of sending practice, as well as receiving practice when another person is available to send code, the learner should equip himself with a code practice oscillator, complete with hand key and 'phones. In this manne- he may send to himself, getting valuable training in handling the key and forming the characters. The use of a code practice oscillator is helpful also for training in reception, particularly in the beginning stages, since the code can be sent at speeds proportionate to the beginner's ability.

The Code Practice Oscillator

A code practice oscillator is an extremely simple piece of equipment, and even the novice can construct one with some certainty of immediate success. The simple oscillator shown in the photo-

graphs and diagrammed in *Fig. 1* will provide a satisfactory practice set.

The oscillator is built on a wooden base about four inches square and ¾" thick. The small panel holding the switch and two jacks is made of ⅛" tempered Masonite, but may be of thin wood or any insulating material, or even of metal if the jacks are wired so that the terminals which join them are those grounded to the panel.

The transformer is a small audio transformer, of about 3:1 secondary-to-primary turns ratio, such as may be picked up inexpensively in radio stores, or from a serviceman or ham, most of whom have several lying about unused. The 500,000-ohm resistor (½-watt rating) and 0.01-microfarad condenser in the lead from the transformer to the tube grid may be obtained for a few cents at any radio shop. An octal tube socket holds the 1G4G tube. The switch is a standard single-pole single-throw switch employed to shut off the filament battery when the oscillator is not in use. (If the wires to the batteries are disconnected each time, the switch may be omitted).

The batteries used are single flashlight cells. Six of them are wired in series and taped together. Alternatively, for greater volume and longer life,

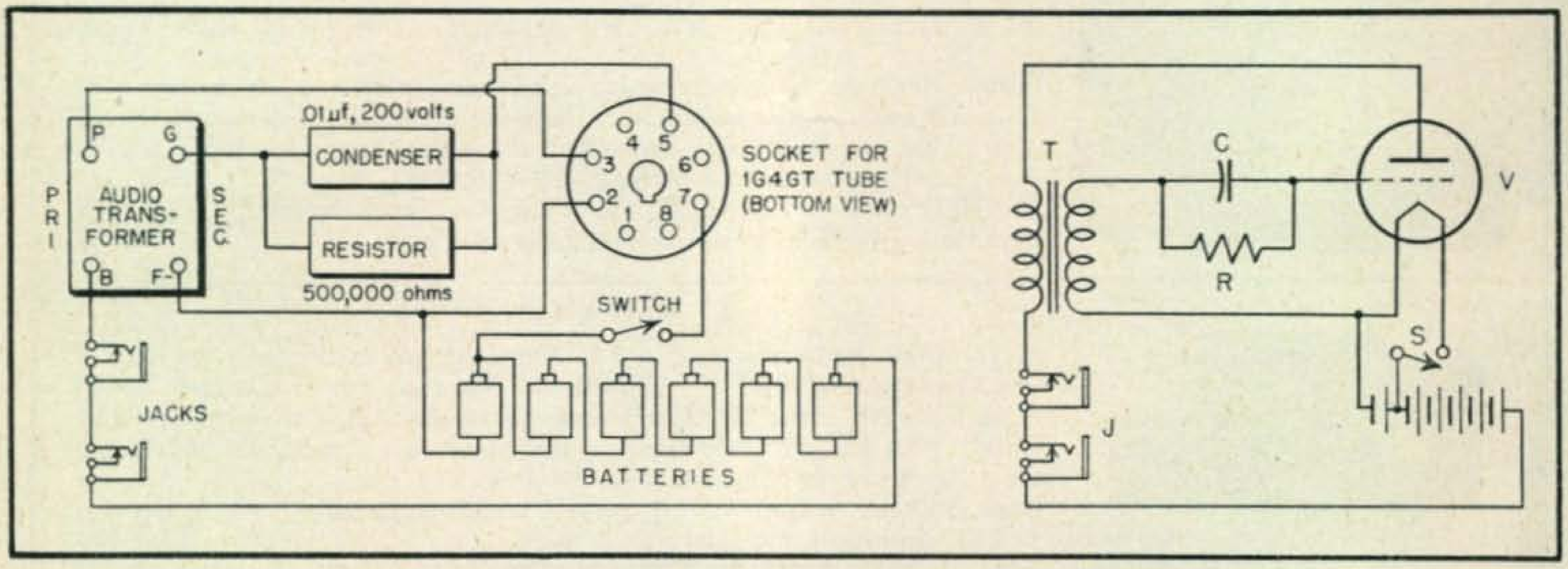


Fig. 2. Pictorial and Electrical wiring diagram of the code oscillator.

NEWARK'S SENSATIONAL SALE OF SURPLUS RECEIVERS and TRANSMITTERS

6-Band, 8-Tube SUPERHET

BC-348 RECEIVER 49^{50}

Here's the perfect rig for Hams . . . for aircraft, marine, mobile use, etc. Has 6 Bands covering 200 kc to 18.0 mc (excluding BC). Highly sensitive receiver with extremely low noise level. **Features include: Crystal Band-Pass Filter, Voltage Regulated Osc., 2 Stages RF Mixed, 3 IF's, 6 Bands, 8 Tubes, Built-in 24 volt Dynamotor** — can be converted to 110 volt operation. Electrically Perfect and Guaranteed—removed from unused aircraft. An Amazing Buy! Approx. 50 lbs.

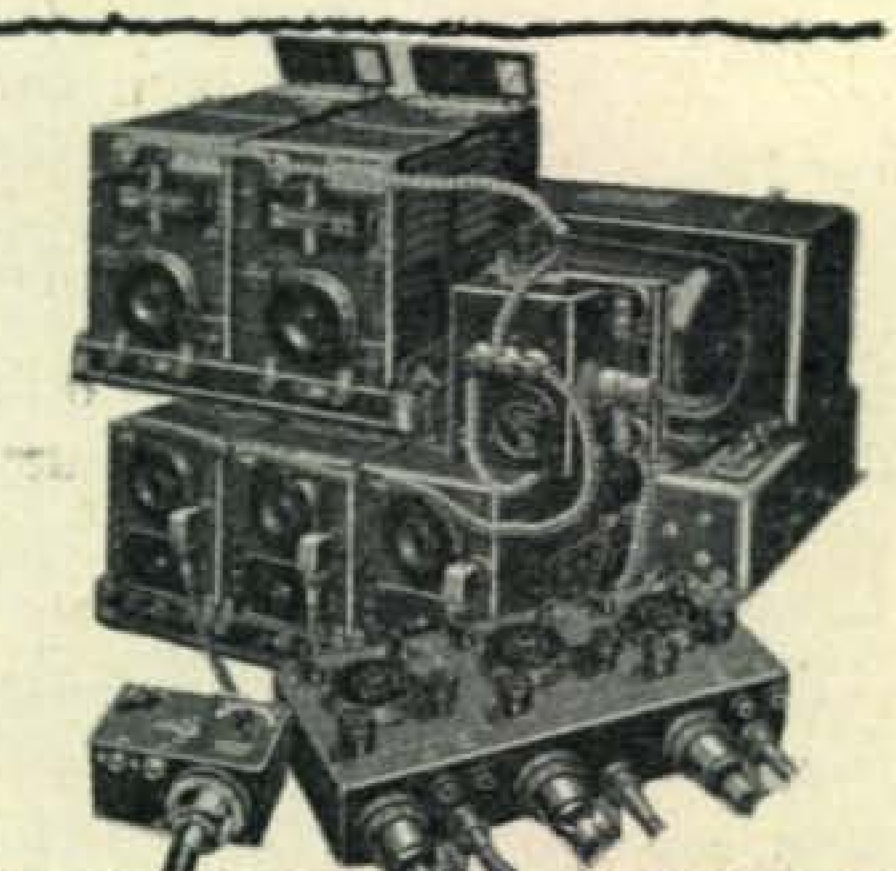
FREQUENCY METER

BC-221 39^{50}

A really beautiful precision outfit that every amateur should own. This Frequency Meter can be used as Signal Generator and VFO. Helps you meet FCC Regulations. **Meter has Crystal Calibration in all ranges, 125 kc to 20,000 kc. Includes original Calibration Charts and Crystal, which alone is worth almost our price for the entire unit.** Works on 110 VAC. Vibrapack, or Batteries. Electrically Perfect and Guaranteed—removed from unused aircraft. Complete with Tubes, ready to operate. Don't miss it!

Great Transceiver Value!

SCR-274 N COMMAND SET $39



What a Buy! All this valuable gear for practically a song! Use these units as stand-by rigs or salvage the precision components. Either way you get phenomenal value.

YOU GET . . . 3 Receivers covering 190-550 kc; 3-6 mc; 6-9.1 mc, 2 Transmitters with Crystals covering 3-4 mc and 4-5.3 mc, 4-24 volt Dynamotors (can be converted to 110 volt operation), Modulator, 2 Tuning Control Boxes, Antenna Coupling Box, 29 Tubes included. A small mountain of equipment. . . . Electrically perfect and and Guaranteed — removed from unused aircraft. Parts alone worth many times the amazing price. Limited Quantity. Get your order in NOW!

75 WATT PHONE RIG

BC-375 E AAF XMITTER

A complete transmitting outfit for CW or phone operation. Cost over $2,000 to make. You pay less than 50¢ a watt . . . while stocks lasts!

You Get . . . 7 Tuning Units, 200-12000 kc; 24 volt Dynamotor (can be converted to 110 volt operation) with Relay, Filter, and Fuses; Antenna Tuning Unit BC-306A; Complete Set of Tubes. Electrically Perfect and Guaranteed — removed from unused aircraft. Wgt. about 400 lbs. A wonderful buy for any Ham!

$32 50

All-Purpose 2-METER RIG

SCR-522 RECEIVER TRANSMITTER 38^{50}

By all means get this swell VHF Transceiver . . . one of the finest and most economical 2-Meter rigs you can buy today. Now available for a small fraction of the original cost.

Consists of 10-Tube Superhet Receiver with squelch circuit, 7-Tube XMitter, Remote Control Box, 28 volt Dynamotor (can be converted to 110 volt operation). Complete outfit with 17 Tubes, 4 Crystals. Perfect and Guaranteed—removed from unused aircraft. About 100 lbs.

WAR SURPLUS TRANSMITTING and SPECIAL PURPOSE TUBES

2AP1	$2.25	304TH	$12.00	811	$1.95	860	$3.00	75TL	$2.25	927	$1.05
2C40	2.63	715C	33.00	813	6.75	861	90.00	826	2.25	931A	1.88
2C44	1.50	800	2.25	814	4.50	955	.75	830B	5.25	954	.75
2X2/879	.90	801A	1.73	815	2.25	956	.75	836	1.50	958A	.75
5AP1	9.00	802	1.58	816	.60	957	.75	837	3.38	959	.75
6J4	1.50	803	9.00	828	9.00	1619	.75	864	.60	1616	3.00
10Y	1.50	804	6.75	829B	3.00	1624	.90	865	1.50	1626	.60
VR105	.75	805	3.75	832A	4.05	1625	.75	872A/872	3.00	2051	.90
211	1.13	807	1.05	838	3.75	1629	.27	884	.75	VR150	.75
217C	7.50	808	3.00	843	.75	1C21	.75	922	.73		
250TH	9.00	809	1.50	845W	3.75	2D21	.60	923	.45		

50% DEPOSIT REQUIRED WITH ALL C.O.D. ORDERS

SEND FULL AMOUNT SAVE C.O.D. CHARGES

• MAIL ORDERS FILLED FROM EITHER NEW YORK OR CHICAGO

NEW YORK
Offices & Warehouse
242 W. 55th St., N.Y. 19

NEWARK ELECTRIC COMPANY, INC.

CHICAGO
323 W. Madison St.
Chicago 6, Ill.

New York City Stores: 115-17 W. 45th St. & 212 Fulton St.

SEND ORDERS TO 242-S W. 55th STREET NEW YORK 19, N. Y. OR 323-S W. MADISON ST. CHICAGO 6, ILL.

a No. 6 dry cell may be used to supply the filament and a 22½-volt "B" battery plate supply.

The wiring need not be fancy. Joints should be soldered, however, so that there will be no loose connections. When the wiring has been completed, check with the diagram and photographs to see that all connections are correct. The key and headphones may then be plugged in and the switch turned on. When the key is depressed a tone should be heard in the 'phones. If no tone is heard, try reversing the connections to either the primary or the secondary of the transformer. *Don't* reverse both; just one or the other. If this does not do the trick, look for faulty parts, dead batteries, loose connections, and so forth. If care is used, however, there should be no trouble.

Two accessory items of equipment are necessary, the headphones and the hand key. Both are used constantly in amateur operating, and consequently units of good quality should be bought for continued future use. Neither is expensive, especially at the moment when enormous quantities are on the war surplus market.

Theory

The foregoing may lead the reader to believe that there is little to be gleaned from any series of articles dealing with instruction in the knowledge necessary to becoming a ham. Such is not the case. We have touched on the laborious factors of learning the code and laws in passing, as a warning of the industrious application they require, before getting down to the more enjoyable task of determing just what it is that makes a radio receiver or transmitter tick.

It is only too true that many a present-day ham learned just enough "theory," possibly by a process of memorization alone, to pass the examination and receive his licenses, and then promptly forgot it all. This does not mean that such hams are not good operators, because many of them are. The purpose of amateur radio is not operating alone, however. There are many facets to being a ham, and each individual has his preferences. The best ham is the one who is balanced in his interests, operating both 'phone and code, experimenting and building, handling messages and performing services that are typical of ham radio at its best.

The writers feel that every ham should know how and why his receiver and transmitter work. It isn't necessary to have a degree in electrical engineering to understand at least the fundamental portions of these things, nor is it necessary to be able to use higher mathematics in order to solve many of the problems that arise in ordinary everyday experimentation, construction, and operation of radio equipment.

Theory and Construction

The purpose of the installments which will follow in this series is to lead the beginner through the construction of several pieces of equipment, all of them usable in the operation of an amateur station. During this process the writers will attempt to explain the various phenomena so that they are understandable, and in such a manner so as to pass the FCC examinations.

We shall not set before you a series of questions and their answers. Rather, the work is designed in such a manner that, by learning the method of operation of the pieces of equipment described, the candidate will be able to draw upon this knowledge in answering the questions posed.

Understanding the experiments to be performed will probably be a simpler task if more detailed explanation is available. Best of all is personal instruction by a competent radio man—a ham or some other person with thorough understanding of the processes involved.

If no instructor is available, use the best books available. Even the ham who explains things to you will probably have to dig into one of two standard textbooks to get all the answers. These two books are *The Radio Amateur's Handbook*, published by the American Radio Relay League, and *The Radio Handbook*, published by Editors and Engineers, Inc. A third is the *Receiving Tube Manual*, issued by the Radio Corporation of America. All are on sale at ham supply houses, and each should be in the ham's personal library.

There are other textbooks, mostly more technical in content. They are excellent, however, after one has acquired the necessary basic knowledge. These may be purchased, or alternatively, consulted at the nearest public library.

Last, but far from least, may we point out that there are two national magazines devoted to amateur radio. These are *QST*, the official organ of the American Radio Relay League, and *CQ*, in which you are reading this article. Both contain a wealth of valuable material—valuable to beginner and advanced ham alike. We recommend that both be placed on the "must" reading list of every prospective ham.

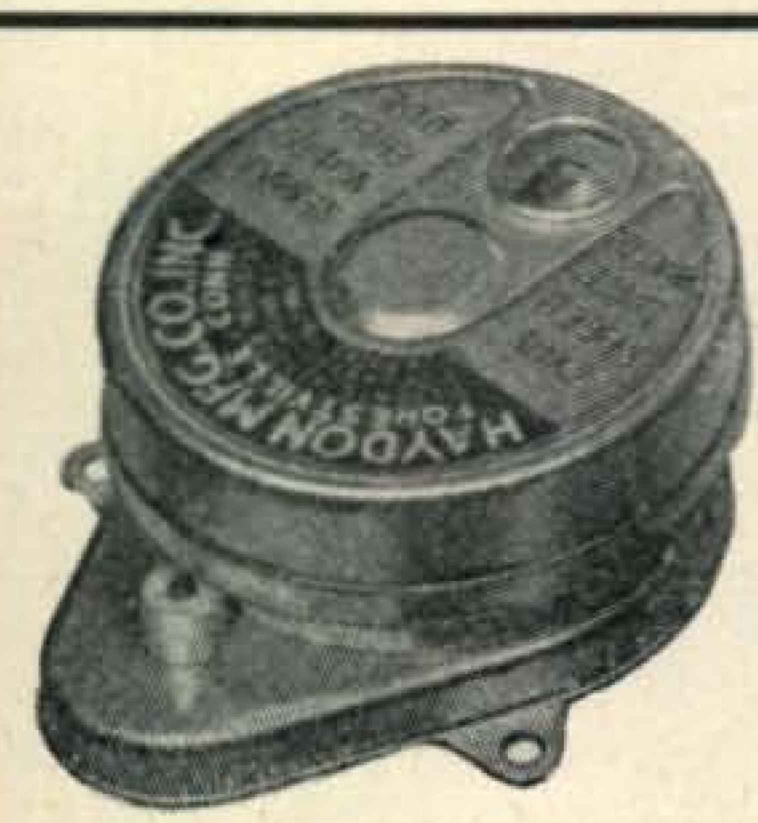
Subscribing to *QST* involves becoming a member of the American Radio Relay League, and we recommend that this step be taken, since the League is the only strong national group organized to represent the ham. While you're in a joining mood, look up the local radio club nearest your home. You'll find a grand bunch of fellows, and you will learn plenty from them.

With these words, then, you are launched on your career as a neophyte ham. As hams, the writers wish you all the best, a load of good luck—in short.

"TAB"
That's A Buy

GE or equal Vacuum Condenser 100 mmf 7500V/24Amp/28mc's List Price........................$12.00
Dimensions 4-9/16"x1-5/8"Dia-9/16"D "TAB" special **$4.95** @ Two for. .$8.95
GE or equal Vacuum Condenser 50 mmf 7500V/20A/32 mc. List Price........................$10.00
Dimensions 3-5/16"x1-5/8" Dia.-9/16"D "TAB" special **$4.50** @ Two for. .$8.40
Condsr oil 4mfd/500WVDC Ten for........................$ 4.95
CONDSR oil 10mfd/600WVDC Two for...................... 2.50
CONDSR oil 20mfd/600WVDC Two for...................... 4.95
CONDSR oil 4mfd/600 TLA Two for........................1.25
Tubular .01/1500WVDC. Ten for........ 1.50
Tubular .1/600WVDC. Ten for.............. 1.90
Tubular .1/800WVDC. Ten for.............. 2.20
Condsr oil 15mfd/330VAC/1000WVDC 2.95
Condsr oil 3mfd/330VAC/1000WVDC 1.25
Condsr 3 mfd/2000WVDC. Two for......... 5.00
Condsr 2mfd/2000WVDC. Two for.......... 4.25
Condsr 2mfd/5000WVDC. Two for......... 14.50
Condsr 2mfd/5500WVDC.................. 7.95

STROBO-FLASH CONDSR 24mfd/660VAC/ 200WVDC................................$ 7.95
CONDSR WST Ineerteen 2mfd/12500WVDC @ 25.00
CONDSR WST Ineerteen 1mfd/25000WVDC @ 75.00
CONDSR OIL 0.5mfd/600WVDC bathtub 5 for. .95
CONDSR CD OIL TLA 2mfd/600WVDC 2 for. .79
CONDSR RF 25mmfd/10000V wkg new 3 for... .75
CONDSR CD OIL 6mfd/1500WVDC 2 for.... 4.50
CONDSR .01mfd/600WVDC molded, Ten for.. .95
CONDSR MICA .01mfd/2500V (**$3.40**) Two for 1.00
CONDSR MICA .01mfd/5000V (**$5**) Two for... 1.80
CONDSR MICA .0042mfd/8000V (**$36**)..... 4.50
CONDSR MICA .0003mfd/10000V (**$42**)...... 4.95
TELEVISION Pulse Transf for BTO.......... 1.49
NAVY Sea Trunks *L.N. 22x16x12" fibre...... 3.00
POWER RHEOSTATS ASSM'T 25&50W Six for 4.95
WESTON 796 OAK CASE 8¼"Sq-2Comp Test eq 4.50
F3 RECEIVER RELAY R. mtd. 3½" x 19" fixed tuned 6 tubes & pwr supply & manual NEW 13.45
NEON V4/GT Siglite dual tel plug 3 for........ 1.00
CONTROL KIT ABJ 50to2meg POTS 10 for 2.50
RESISTOR KIT BT½&1W 50to2meg 100 for 2.50
COND KIT SILVER & MICA units 50 for 2.00
W.W. RESISTOR KIT 20 for................ 1.00
KNOB KIT ASSTD with bushing 25 for...... 1.25
ROTARY SWITCH KIT Six for............ 1.75
SOCKET KIT 25 Asstd Ceramic, mica B, etc.. 2.35
TRANSFORMER 3800VCT/6KW/2.7A, inpt 200to400V................................ 45.00
TRANSTAT 88-132V/18.2Amp—110V inpt.... 29.50
GR VARIAC 200CU/860Watt............... 14.95
RF CHOKE 2.5mh/500ma Hammarlund CH500 .69
RF CHOKE 85 mh Hammarlund (**$3**)......... .97
RF CHOKE 1mh/300ma NATIONAL 3 for... .89



SYNCHRONOUS HAYDON CLOCKMOTOR 60cy/10V24RPM S.P. SWITCH EXCELLENT FOR AUTOMATIC KEYER, EXPERIMENTAL WORK, TIME DELAY, FLASHER, PRODUCTION TESTING, CLOCK hundreds of uses, **GOVT. COST ($7) "TAB" Extra Special $1, Two for ...$1.69**

ANTENNA SECTIONS
SC M50; 39¼" long 12 for $1

COLLAPSIBLE TELESCOPIC ANT., AN30 12" to 9 feet $1.49

WE Dynamic mike.... $9.95

EDISON TIME DELAY RELAY 115V/10 Amp........ $1.49

$2 Min. order FOB N.Y.C. Add Postage all orders and 25% deposit. WHitehall 3-3557. Send for catalog 300. Specialists in International Export. School, College & Industrial trade. Money back "TAB" Guarantee.

RCA 808 JAN-CRC New Gt'd Fil 7.5V/4 Amp Plate 1500V/200 Watts Rated 140 watts output each "UHF" (List $7.75) "TABS" PRICE $2.70. Two for. .$5.00
1625 (S'807) Boxed new, 2 for..... 1.30
446A/2C40 Lighthouse Tube...... 2.85
807 JAN GTD New, Two for...... 2.00
304 TL GTD New, Two for...... 7.81
955 JAN GTD. 2 for 1.45
956, 957, 958A, 959 & socket, each. .90
872A New & sockets, Two for 5.75
866A New & sockets, Two for.... 2.00
3B24 HV Rectifier 20,000V/60ma... 4.95
2V3G JAN HV RECTIFIER 16,500V (3.40) Two for 1.50
829B/3E29 boxed gtd new......................$2.90
3BP1 Boxed Jan new Gtd & socket............ 2.99
5BP1 or 5CP1 new Gtd....................... 3.95
2C26 Boxed new 10watts UHF 2 for........... 1.50
954 Boxed new Gtd @ 50c Five for............ 2.00
6AK5 Boxed new Gtd @ $1, Ten for.......... 8.90
6AG5 Boxed new Jan @ 81c, Ten for.......... 7.49

2050, 2X2, RK60/1641, 6SL7, 1E7G @........ $1.25
35L6, 50L6, 35Z5, 12SQ7, 12SH7 Two........ 1.80
WE 717A Door Knob tube new. Two for...... 3.85
WE 703A UHF Door Knob tube new.......... 5.95
6J4 JAN Gtd Two for...................... 2.98
805 or 845 JAN & Sockets. Two for.......... 8.95
5BP4 JAN & socket......................... 4.90
VR127A new & Connectors. Two for.......... 5.98
Copper oxide WST RECTOX F.W. 12V/1.25 A 3.40
SELENIUM IT&T 6B8AV1 F.W. 85V/2.4 Amp 6.95
MAZDA No. 323/3V/190ma (LP**$1.85**) Four for 1.00
MAZDA No. 49Minbay 2V/60ma (LP**15c**). 10 for 1.00
NE15&51 Neon Glolamp 1/25 watt 10 for...... .80
MAZDA No. 44 Minbase 6.3V/250ma 10 for... .75
Weston 15VAC Meter 3"sq 476 model.......... 4.25
GE 2.5&25ma zero ctr Galvo 3½" B'C......... 3.95
Socket OCTAL Amphenol 78ST; 25 for........ 1.50
Socket MAGINAL Ceramic 49-SS11L.......... .49
GE 3" B'C 150VAC meter RD new............ 4.95
Dynamotor 12/24inpt-250V/110ma, 12V/3A 1.95
Dynamotor 12/24inpt-500V/50ma, NEW....... 1.95
" with inpt-outpt filter low & H.V.C' above 5.95
BLOWERS *LN 115V/60cy Dual 200cuftM.... 13.95
CRYSTALS AMATEUR FREQ'S. Four for ... 3.00
CONTACTOR 4PST-N.O./30Amp/110V inpt 4.95
TBY COMPLETE WITH VIBRAPACK.... 39.95
SYNCHROSCOPE 3" NEW NAVY Complete.. 59.50
TRANSF OUTPT PP6V6/10watts cased 1.49
TRANSF CASED TAPPED LINE TO V.C..... 1.20
Fuse assmt 250ma, 4amp, 200ma; 300 for....... 3.95
TRANSFORMER GE HV insl 115V/60cy, outpt Two5V/8A @.............................. 4.50
Transf HV insl 220V/60cy, outpt 5V/20amp... 4.50
Transf HV insl 115V/60cy, outpt 5V/125 amp.. 7.95
PRECISION 1MEG WW RESISTORS, 3 for. 2.50
Transf line to line 500,333,250,200,125 50 ohms ± 1DB Cased Thermidor mfgr.................. 1.95
TBY NEW Vibrapack & storage battery Willard 4V/40AH, V'pack outpt 156V/30ma, 3V/375ma, 1.5V/200ma, 7.5/20ma, manual, NEWGTD.... 9.95
Constant impedance Rotary Beam Coupler.....$ 3.95

AUTOSYN BENDIX

Brand new gov't sealed and inspected packed in overseas cans synchro-transmitters AC 115V60CY operation continuous heavy duty type: high torque. Precision accuracy made for gun fire control; cost gov't $90.00 wt. each 5 lbs.

"TAB" Special two for $15.95

Transformer cased "LANGEVIN" PRI 105 to 250V 50/60cy; Sec 2240VCT/500ma, 12V/4.5A, 19V/3.5A 2.5V/10A, HVinsl **$11.50**, Two for....**$19.95**
Oscilloscope 3" KIT 3BP1 includes transformer 115V/60cy Pri; 375VCT/110ma, 1320V, 5V/3A, 2.5V/325A 6.3V/2.75A, New tubes, 3BP1C'Ray, 5Y3GTRect, 2V3GRect Condsrs, choke, LOW & HV supply Complete.................................... 16.95
RM-53 Remote Control for transmitter also T.L.. 3.49

"TAB," Dept. Q4A, Six Church Street, New York 6, N.Y., U.S.A.
CORNER OF CHURCH & LIBERTY STS., ROOM 200

6-METER DX RECORD

[from page 35]

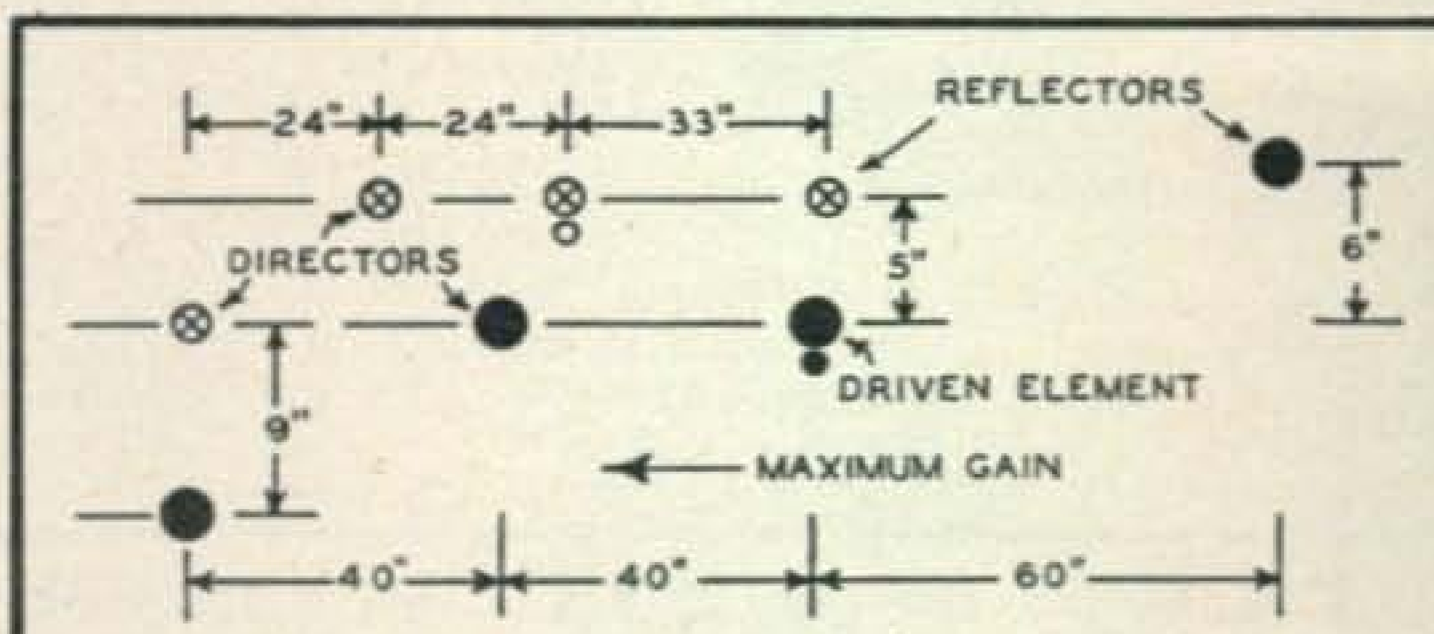
only a weak fading carrier on KH6DD's frequency was heard at 0057 GMT by W6VDG/KW6.

These contacts on the 50-mc band exemplify the oft-made statement that this band is open in various spots throughout the world where activity is very low. Apparently the Wake Island to Hawaii contact could have been made on a number of occasions before January 25. Conditions across that North Pacific Ocean path are typical of the high MUF expected during this part of the sunspot cycle in that area. Undoubtedly, 50-mc conditions next fall and winter will be much better than those of this season. Let's see more activity in those areas from the west coast of North and South America to Okinawa and the Philippines and south to New Zealand.

The Equipment—At J9AAK

The transmitter at J9AAK was a modified TDQ v-h-f unit. Using an 829B in the final amplifier modulated by a pair of 807s. The first part of the contact on January 26 (Okinawa Time) was made with only 67 watts input, although 87 watts input was used during the last contact in the afternoon. The receivers were an S-36 and an ARR-5, which is the airborne model of the S-36. The antenna at J9AAK had been installed the afternoon of January 25 and is rather unorthodox in the manner of spacing of the parasitic elements.

Below is shown the end view of the irregular beam element spacing to obtain an optimum low angle of radiation. Note that the first director of the 6-meter beam is on the same horizontal plane as the driven element and the director of the 10-meter beam. The reflector for the 10-meter beam is displaced about six inches above the driven element and the second 10-meter director is about nine inches below that plane. Basically, the 6-meter beam is a converted AN/TRC plumber's delight with co-ax feed. Preliminary tests indicate that this is no inter-action between the two beams.



J9AAK 6 AND 10 METER BEAM

SURPLUS *Values* PLUS *Satisfaction...* *all from* RADIO SHACK

*The one and only original RADIO SHACK is located in Boston and has no branches or affiliates elsewhere.

BC-348 RECEIVER

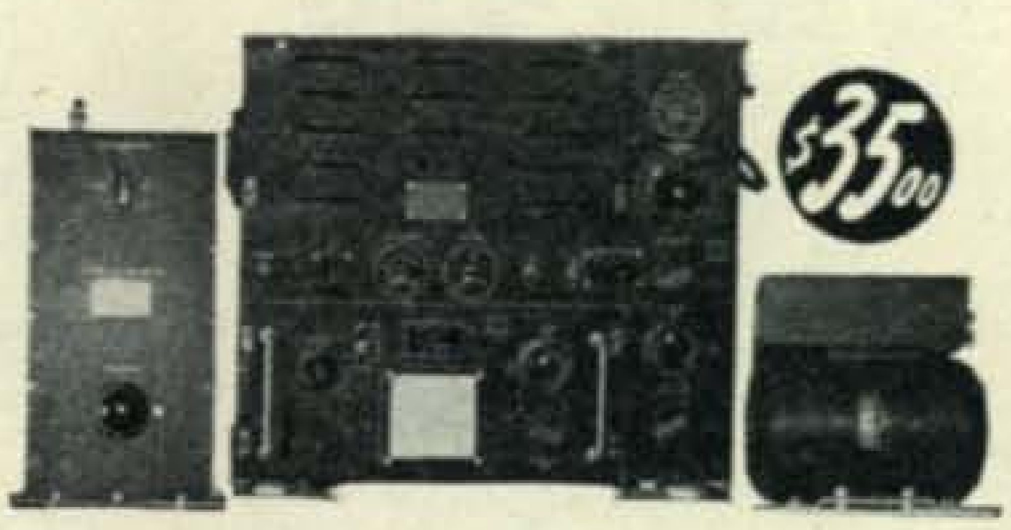
Acclaimed the best military receiver for amateur use, this easy-handling set covers six band-switched ranges from 200 kc. to 18 mc (less BC band), with constant sensitivity on all bands. Has Xtal filter, AVC, MVC, BFO, automatic noise compensator, temperature-compensated oscillator; output at 300 or 4000 ohms; vernier tuning on all bands. Furnished with built-in dynamotor, full set of tubes, and details of conversion to 110v. a-c.
Complete a-c conversion kit for BC-348 .... $6.50

XMTG CAPACITORS

Nationally known, high-voltage, oil xmtg capacitors, all in rectangular cases, with stand-off insulators.

Mfd.	Volts d-c	Net Ea.	Mfd.	Volts d-c	Net Ea.
4	600	$0.71	2	1500	$1.20
6	600	.79	4	1500	1.59
8	600	1.19	6	1500	1.79
10	600	1.29	2	2000	2.95
2	1000	.71	8	2000	3.75
4	1000	1.19	2	2500	3.25
8	1000	1.49	2	3000	3.45
10	1000	1.79	4	3000	4.25
			2	4000	4.95

AAF XMTR BC-375-E



For a real bargain, you can't beat these used, but in A-1 shape, BC-375's. Furnished complete with five tubes, seven tuning units covering 200 kc to 12 mc (less BC band); antenna tuning unit BC-306-A with variometer and tap switch, dynamotor PE-73-C with relay, fuses, and filter. For detailed description of this 200-pound bargain, see our Feb. QST adv.

SCR-522 VHF XMTR-RCVR for all-purpose work at 100-156 MC

Used as standard equipment on all AAF and RAF planes, this set is now yours at but a small fraction of its original cost. Ten-tube crystal-controlled superhet has 3-microvolt sensitivity at 10 mw output. 7-tube temperature-stabilized xmtr delivers 15 watts. Remote control box gives push-button tuning on four crystal-controlled send-receive channels. Dynamotor (28-volt d-c) powers entire rig. Furnished with all tubes, plugs, and detailed dope on conversion to 110-volt a-c operation. Condition excellent. Weight about 100 lbs.

FREQUENCY STANDARD BC-221

This stable, heterodyne frequency meter checks up to 5th harmonic on most receivers and up to the 125th on the better ones. Fundamental ranges are 125-250 and 2000-4000 kc; stability is better than .005%; instrument works on 110 v.a.c., on vibrapack, or on batteries. Use it for a signal generator or make it into a VFO that's a humdinger. Complete with tubes, original crystal and calibration charts. Excellent condition. Order today!

PE-103 DYNAMOTOR New Lot, only $9.00

Brand new, in original Signal Corps packing; delivers 160 mils at 500 volts; operates from 6 or 12 volts d-c; complete shock-mounted assembly includes breakers, switches, relays, filters, and cables.

BUYS in TUBES

872A	$2.25	829B	$3.94	814	$4.50
807 West'hse	1.05	829B socket	.69	826	2.25
811	1.95	304-TH Eimac	9.95	832A	4.05
813	6.75	809	1.79	931A	1.88
211 GE	4.95	810	2.59	2AP1	2.25

Speed delivery and save C.O.D. charges — send full amount with order: 50% deposit required on all C.O.D. orders.

The RADIO SHACK Corp.

CABLE ADDRESS · RADIOSHACK
167c WASHINGTON ST., BOSTON, MASS., U.S.A.

The Equipment—At KH6DD

Bob Mitchell claims that the only wonderful thing about his transmitter is that it works. The final amplifier on the 50-mc band is a pair of VT127As suspended in place by four tip jacks set in bakelite with Fahnestock clips for terminal connectors. The final is driven by a single 100TH doubler, which is in turn driven by an 807 doubler. A 6V6 crystal oscillator on 6250.3 kc starts the rig off. The VT127As are loaded to 300 ma at 1800 volts and are modulated by push-pull 810s. The biggest trouble with the VT127A final was a terrific parasitic when it was first tested. The off resonance current was accidently determined to be about 600 ma. The no load dip (?) ran nearly 150 ma. Finally a one ampere 10-20 meter r-f choke started to smoke and the trouble maker was located. When the offender was substituted with a small junk-box weary v-h-f choke the unloaded plate current came to about 40 ma.

A rhombic or an 8JK twin-three are available for the 6-meter band. These are coupled to the final with three turn loops. The 8JK has elements which are 103 inches long with four-inch spacing between wires and 43-inch spacing between elements. The feeder is a 300-ohm twin-lead. The 8JK is mounted about 45 feet above ground and is rotated by a pulley cable system from the shack. The receiver for the 6-meter band is an S-36 converting into a Super Pro.

The Equipment—At W7ACS/KH6

Over at Pearl Harbor on the island of Oahu, W7ACS/KH6 is using a converted SCR 640 transmitter which a pair of 24Gs in the final. These tubes run in this transmitter at about 70 watts input. The receiver is an S-27 converting to an AR-88 for increased selectivity. The beam antenna was being installed on the day of the great DX and so was hurriedly tuned with the aid of a yardstick and errected in about 30 minutes. The three-element beam is fed with 52-ohm co-ax with no matching.

The Ionosphere

These two-way contacts in the amateur 6-meter band are of particular importance in propagation analysis. As in the instance of the G6DH–G5BY to W1HDQ contact the 6-meter transmissions took place near or during periods when the ionosphere was considered to be disturbed. Whether this 50-mc enhancement is due to the so-called 'first effects' of the ionosphere storm remains to be seen. More activity and the complete reporting of work accomplished as in the above instances can supply the answer.

Many potential 6-meter DX men claim that unless they spend considerable time either calling CQ or listening on the intermediate frequencies a la W6QG or G6DH they will probably miss many of the DX possibilities. The solution to this problem is not a simple matter, however the *Propagation Editor* of *CQ* is preparing cross-band MUF approximation graphs, which will indicate the MUF in areas where the ten and twenty meter skip distance may be observed. The first of these useful graphs appears on page 35. The MUF factors are based upon average *F-2* and sporadic-E layer heights. While the *F-2* layer will vary somewhat in height and consequently increase or decrease the MUF slightly, the graphs are prepared in such a fashion that this factor may be neglected. All that is required to operate the approximations is a flat map. Using your own QTH as a center point draw concentric circles for each hundred miles up to 1300 miles and then listen for the nearest stations you are hearing about 29.0 mc. If the skip is regular *F-2* and the nearest stations are about 1050 miles distant erect a vertical line on the graph at 1050 miles. At the intersection of this line with the *F-2* layer variable read across the graph to an approximate MUF of 44.0 mc. It is important to remember, however, that this indicates the MUF in only that one direction. The approximate skip distance for a single-hop on 29.0 mc to realize a 6-meter opening is about 875 miles for the *F-2* layer and about 475 miles for the sporadic-E layer. Further data on this new system will be published shortly.

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

[*from page 50*]

starting at 0 degrees on the hour, rotating 90 degrees every 15 mins, around the compass. Any one interested write him at 9121-82st, Woodhaven, L. I.

SK

Well fellows by the time this reaches you the summers DX on both 50 mc skip (Es) and 144 mc bending will be under way, so don't forget to drop us a line covering your operating, trying to have it in our hands by the 20th of each month. The 50-mc honor roll is open for new stations so how's about it. Good DX and be seeing you.

YL FREQUENCY

[*from page 52*]

working a YL in every state. Also in the offing is a new 20-meter beam with hopes of piling up more DX. In addition, Dot's trying for WAS on every band.

We were interested in a clipping from the Pittsburgh Post-Gazette about W3VYU, Theresa McLaughlin, only girl in Carnegie Tech's electrical engineering school. Theresa, it seems, was the youngest licensed ham in the country at 14. At 16 she was flying and experimenting with radio in the air. Expect we'll be hearing more about Theresa after her graduation next month.

W2PMA, Lillian, now operating from Mamaroneck, has a unique system. She's giving code lessons to her bakery man—in exchange for pies!

That's it for now I guess. See you next month. 73.

DX PREDICTIONS

[*from page 38*]

Dr. John Q. Stewart of the Princeton University Observatory expresses the belief that the maximum will be in January of 1948. The famous Swiss astronomer Waldmeir has predicted June or July of 1947, while C. N. Anderson of the Bell Telephone Laboratories has announced that late 1950 or early 1951 will be the most probable period of the coming sunspot maximum. Which of these gentlemen will eventually be proven correct is difficult to say at the present time. The sunspot number is still rising and the mean latitude of the sunspot groups is still rather high, in fact, much higher than during previous maxima. Whatever the answer, the DX men need not worry for the very rapid rise in sunspot numbers clearly indicates that the present level of DX conditions will persist for at least two to two and one half more years and we may safely expect good 10-meter conditions for about four more years at the very minimum.

In *Fig. 1* the average maximum usable frequencies (MUF) and the optimum working frequencies (OWF) are shown for a path from the W5-W9-WØ districts to the area near Buenos Aires, Argentina. The top curve line is the predicted MUF and the inner curve which is generally 15% below the MUF outline is the suggested OWF. In amateur practices, DX contacts can be made as soon as the MUF outline indicates that that wavelength will be open over the particular path under consideration. Schedules should be made when the OWF outline indicates the frequency is satisfactory for communication purposes. Over the path in *Fig. 1* or approximately 160°, ten meters is expected to open around 0615 hours and close around 1900 hours CST. Peak MUF of about 40.0 mc is predicted at 1200 hours CST. Day-time absorption will prevent 20 meter activity at midday, but good conditions will occur on this band after 1500 hours CST.

In *Fig. 2* the MUF-OWF curves for a path from the east coast of the United States to the New Zealand and Eastern Australia area are shown. During this particular season of the year the MUF is expected to peak twice in each day. The first peak will occur at about 0845 hours EST. This peak will correspond to the best period for 20-meter transmissions into this area. Conditions will decline after 0900 hours until a sharp dip is reached at 1300 hours. For those who are now subscribing to the *Basic Predictions* this is a good example of the shifting of the control points with the signal loss occurring at the western end of the path. Between 1500 and 1600 hours a second and somewhat higher peak MUF is reached. The span between the 10-meter intersections of the OWF outline indicates that this band will be open from about 1430 hours to 1800 hours, although scattered signals may be heard until 2000 hours EST.

The predicted average MUF-OWF for a path from the west coast of the United States to South and Central Africa is illustrated in *Fig. 3.* It will be noted that in comparison to previous months the peak MUF is generally down about four to five megacycles. The 10-meter band is expected to open between 0715 and 0800 hours with scattered signals. Best 10 meter conditions is predicted for 1200 hours PST. The 20-meter band will have varying amounts of activity from about 0330 hours to 0030 hours the following day. The best conditions on 20 meters should however, occur within three hours of the OWF outline, or from 0400 to 0700 hours PST and 2000 to 2300 hours PST.

The average MUF-OWF over a path from the west coast to the are s in the far east adjacent to Singapore in the Malay States is shown in *Fig. 4.* As in the case of *Fig. 2* the MUF outline is shown to peak twice in each day. The best 20 meter openings are to be expected during the first peak around 0930 hours PST. Note that the MUF curve passes into the 10-meter band during the first peak, indicating that a few scattered signals may be heard or worked on those frequencies during this period. With the weakening of the western control point the MUF-OWF curves drop to a minimum around 1300 hours PST. A second peak, starting with the sharp rise in MUF at 1400 hours indicates that the 10-meter band will probably open around 1430 hours PST and will remain fairly steady until 1830 hours PST. A fair to good 20-meter opening is also expected after 1800 hours PST.

The east coast-west coast trans-continental MUF during April will probably be about 34.0 mc between 1430 and 1600 hours EST. Ten meters will open on this path from 1030 hours until 1930 hours EST. A noticeable downward trend in the opening and closing hours will be observed in the latter part of the month. Only scattered openings in the 10-meter band from the east coast to northern Europe are predicted for April. These should be most frequent around 1300 hours EST. Ten-meter signals to the Mediterranean ares will be somewhat stronger and will peak around 1230 hours EST. East coast signals to the Caribbean area will be particularly stong

The demand for copies of "CQ" exceeds the supply. Be sure of getting your copy every month by subscribing now. *Use the coupon below.* Attach your check or money order. Don't send cash by maill

Subscription Prices

12 issues	$2.50
24 issues	4.00

In U.S.A. & Possessions and Canada.

Elsewhere $3.50 for 1 yr. $6.00 for 2 yrs.

No subs. accepted for more than 2 years.

Special reduced rates for "Ham" Clubs sent on request.

CQ is sold by leading "Ham" Dealers and on better news stands for 35c per copy.

This new single copy price becomes effective with April issue

—TEAR OUT—MAIL TODAY—

CQ-RADIO MAGAZINES, INC. Call....................

342 MADISON AVE., NEW YORK 17, N. Y.

Sirs: Here is my ☐ check (or ☐ money order) for $.................. Send me .... issues of CQ.

12 issues $2.50—24 issues $4. (Foreign subscriptions are $1.00 higher per year.)

Please indicate: ☐ NEW ☐ RENEWAL

Subscriber's Name (print carefully)....................

Address....................

City.................... State.................... Zone....................

this month with the east coast to Puerto Rico path opening around 0700 hours EST.

The basic predictions of DX conditions are made through the use of the Central Radio Propagation Laboratory D series. Complete monthly information may be obtained by subscribing to the CRPL publications through the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

NARROW BAND FM

[*from page 26*]

maximum allowable carrier input power is not restricted for some other reason (such as the 1-kw limit allowed amateurs). However, it should be noted that this 2 times power advantage of FM over AM, for a given transmitter, does not cancel the loss of three-quarters of the FM carrier power during the final detection process when a conventional receiver is used.

It has also been suggested that it is easier to avoid QRM when detecting NBFM signals because it is possible to receive the desired signal equally well when tuned to one side of it or the other. Since it is also possible to receive AM signals (with some distortion) when detuned fairly far to either side of the carrier frequency, it is believed that this point is debatable.

To sum up, then, we may list the good and bad points of narrow-band FM as compared with AM as follows:

Advantages of NBFM

1. With strong signals and good limiting action, a 3-1 carrier power reduction is possible for a given signal-to-noise and signal-to-QRM ratio, as compared to AM. (The QRM is considered to be a number of heterodynes, more or less evenly distributed in frequency).
2. Elimination of AM modulator.
3. Reduction in BCI.
4. If an AM transmitter is converted to FM, use of the modulator tubes in parallel with the existing class "C" amplifier permits doubling the carrier power output for a given total tube capacity.

Disadvantages of NBFM

1. For weak signals received on AM receivers, the effective carrier power may be thought of as being one-quarter that actually radiated. There is also a further reduction in received S/N ratio due to changed receiver noise spectrum when the receiver is detuned. For results equivalent to AM under these conditions, NBFM requires a carrier power between 4 and 10 times as great as AM.
2. More critical tuning, and inability to keep

a signal in proper tune with the aid of the "S" meter.

3. NBFM is probably more susceptible to distortion due to multipath ionosphere transmission than AM, although the available evidence indicates this effect will not be serious at 10 meters. It may be a factor, however, if NBFM is authorized at the lower amateur frequencies.

It is concluded that when signals are strong and receivers especially designed for NBFM are available this system of modulation offers real improvement over AM in terms of a better S/N and signal-to-QRM ratio. This advantage is particularly attractive in view of the fact that the bandwidth required is no more than for AM. Under present day conditions when it is desired to secure maximum performance with a given number of carrier watts when transmission conditions are poor and signals are weak, NBFM appears at a considerable disadvantage in comparison with AM.

Acknowledgment

The author wishes to acknowledge his indebtedness to his colleague Mr. William E. Evans, Jr., for invaluable assistance in connection with the experimental work, and for helpful criticism of the text. The editor wishes to thank G. M. Brown, W2CVV, James Whitaker, W2BFB and Jack Babkes, W2GDG for their cooperation in the final preparation of this paper.

BC-221 POWER SUPPLY

[*from page 30*]

side of the a-c line since the transmitter a-c input plug is seldom reversed. (If this precaution is not observed the selenium rectifier power supply will be a high potential with respect to ground.) Another and perhaps simpler method is to use a line plug with one of the prongs removed. Unless the plug is inserted in the correct side of the line the power supply will be inoperative. Using this alternative system it is impossible to confuse line polarity.

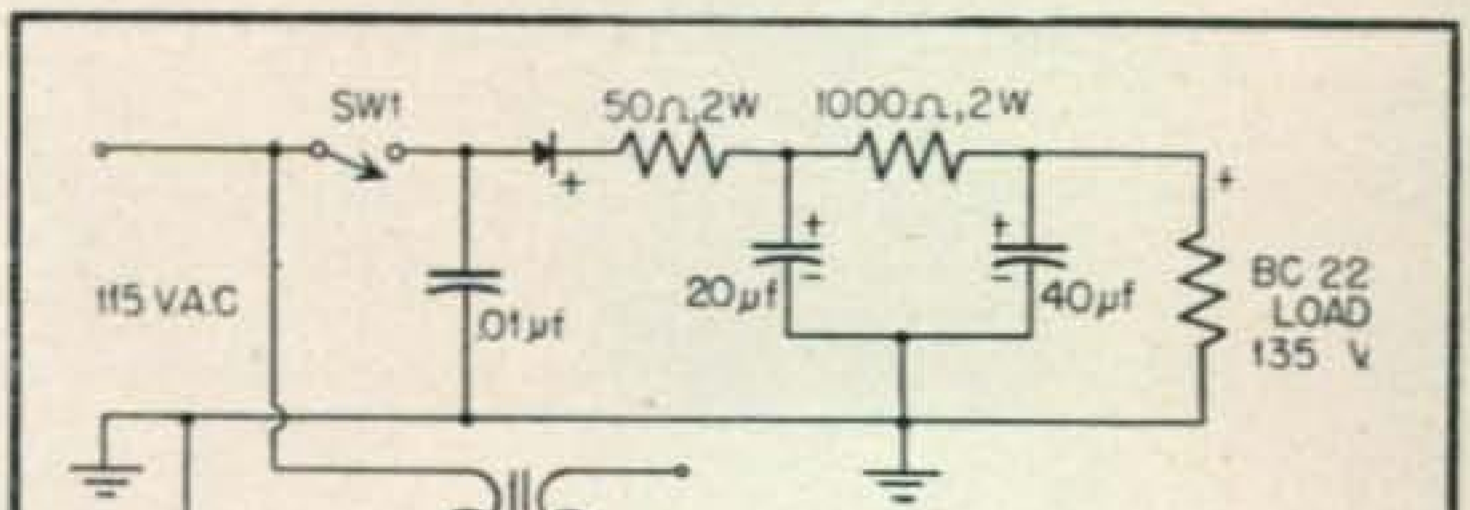


Fig. 2 Circuit diagram of the selenium rectifier power supply.

The ground side of the line may be determined with an a-c voltmeter or using an ordinary light bulb with one side grounded. It will light on the "hot" side of the line only.

Actual size of the compact power supply is determined by the size of the top area of the filament transformer used. The power supply can be made to mount on the chassis of the frequency meter since little heat is created by this type of rectifier. The rotary control switch of the frequency meter was modified so that the first step from the "off" position applied the a.c. to the rectifier circuit. However, a separate control switch, *SW1*, may be employed.

Russell Tighe, W2ALH
Joseph Rywelski

Certain models in the BC-221 series such as the BC-221F may have the cathode of the amplifier tube tied directly to the filament. In such cases disconnect the cathode and connect to ground through a cathode resistor, otherwise severe a-c hum will result.

10-METER STATION

[*from page 19*]

rent. With the antenna connected, the coupling link is varied until a plate load of 120 to 130 ma is indicated. The multi-match modulation transformer is set for a 4500-ohm load impedance. The modulation gain control will probably be set at maximum gain for proper percentage of modulation. Microphone current is obtained from the voltage drop across a portion of *R9*, which is adjusted to supply about four volts to the mike.

The Receiver

Generally, the automobile radio will provide a good foundation for mobile operation and only a small efficient converter is necessary. Our converter consists of a 6AK5 r-f stage, a 6AK5 for the mixer and a 6C4 for the oscillator. The output of the converter is tuned to 1500 kc and is fed by a low-impedance coaxial line to the auto receiver antenna terminal.

The converter is built in a 4" x 4" x 5½" aircraft cabinet. The controls on the front panel of the unit consist of a dial of at least a 3-to-1 gear ratio for tuning the variable 3-gang condenser. A DPDT switch is used for turning the filaments *off* and disconnecting the $B+$ lead when the converter is not used. A switch is necessary for the $B+$ to disconnect the voltage regulator. Another switch is used for antenna switching. The fourth control is the r-f amplifier gain control which is used to decrease the gain when working a high-powered local. A pilot lamp is also used on the front panel to indicate if the converter is *on* or *off* when the auto radio is being used in its conventional manner. The lamp also provides lumination for the tuning dial scale.

The converter schematic appears in *Fig. 3*. The main precaution is the isolation of the r-f stage from the mixer stage. A shield consisting of a piece of aluminum or copper is used to separate the two stages. The output transformer is wound from a small t-r-f broadcast receiver coil. The primary was unwound until approximately 15 turns were left on the form. This provides the low-impedance coupling to the auto radio. A 75-$\mu\mu$f trimmer condenser was soldered across the secondary and the entire assembly mounted on top of the chassis with small brass angles.

The r-f mixer and oscillator coils are wound on ½" long polystyrene rods. Small holes are drilled through the rod for anchoring the wire. The hole for the top of the grid winding is drilled near the top so that the winding may be spaced a little for tracking. The coil forms are supported by drilling and tapping the bottom of the rod and then fastening them to the chassis by 6-32 brass machine screws. A decoupling filter consisting of two 0.1-μf condensers and a 1000-ohm resistor is needed to prevent oscillation when the converter is connected to the auto receiver because of the common power supply. The voltage regulator, consisting of two 1/25th-watt neon lamps, is needed to hold the oscillator plate voltage constant under mobile conditions.

The oscillator signal voltage is taken from the cathode circuit and injected into the grid circuit of the mixer by means of a homemade "gimmick" capacitor. This is composed of a piece of hookup wire soldered to the cathode terminal of the oscillator tube socket and the other end of the lead wrapped around the grid lead of the mixer tube. The first step in alignment is to determine whether or not the oscillator is operating, and set its range so that it will cover the desired band. The oscillator operates 1500 kc higher than the r-f and mixer stages, hence must cover at least 29.5 to 31.5 mc. A communications receiver covering this frequency range is a big help. With the receiver set to 31.5 mc and the converter tuning dial set near minimum capacity, adjust the 25-$\mu\mu$f oscillation padder until the signal is heard in the receiver. With the oscillator circuit adjusted, remove the oscillator and r-f tubes. Connect an antenna to the mixer stage by opening the $B+$ lead to the r-f coil and placing the antenna lead in the plate pin connection of the tube socket. With the receiver set to approximately 30.0 mc, the mixer padder is adjusted for maximum noise. If insufficient noise is present in the background it may be necessary to start up the automobile motor for the ignition background.

After replacing the tubes and the $B+$ lead, connect the converter to the auto radio and tune to 1500 kc. Adjust mixer plate padder for maximum noise. Preliminary alignment is now completed and some stations should be received when the converter tuning is rotated. With a station tuned in, the r-f trimmer is aligned for maximum signal. Mixer input and output padders may now be retuned for maximum signal. Tune in

another station and retune the grid circuits. If signal strength is brought up, it is an indication that the circuit is not tracking. This may be corrected by increasing or decreasing the inductance, whichever the case may be.

RECEIVING TUBES

[*from page 20*]

transformation of the maximum ratings into actual operating voltages. This is accomplished in the following manner.

1. *Cutoff bias*—For oscillator and amplifier service, divide the plate voltage by the Mu factor. This gives an approximate answer, which will be fairly close. Double the calculated bias voltage for Class C operation. *Example:* for the 6N7 with 350 volts on the plates and a Mu factor of 35, the grid bias per section will be approximately 20 volts for class C operation.

   Grid current—Never use more than 100,000 ohms in the grid circuit of any of the tubes in the tables. As an arbitrary value, use 80% of the maximum rated figure. Calculate the biasing resistor using simple Ohm's law by dividing the grid bias voltage needed by the arbitrary current value. *Example:* for use with the 6C4, 8 ma maximum current, 6.5 ma is the arbitrary setting. Thus for 40 volts of grid bias divided by grid current gives 6,000 ohms, which is the approximate grid-leak biasing resistor.

   Doubler operation—For the bias voltage again divide the plate voltage by the Mu factor, but multiply the quotient by three. The grid current should remain about the same and the grid-leak bias resistor may be calculated in the usual manner (note No. 2). Sometimes a higher bias value than the one calculated will give more output, but the maximum in the tables should not be exceeded for optimum circuit efficiency consistent with the lowest possible grid drive and the least unwanted harmonics.

Naturally, the triode will stand up under abuse longer than the pentode. This is because in the pentode it is extremely easy to overload the screen, thus for the additional advantage afforded by the pentode we must watch the important screen and plate limitations. Basically, good amateur design characteristics indicate that the screen grid voltage should be approximately 80% of that shown in the table. Instances where a pentode is being employed as a class C amplifier it is necessary to remember that the screen current varies directly as the grid drive. This means that in order to prevent screen dissipation, the grid driving power should be as low as possible in keeping with good conversion efficiency.

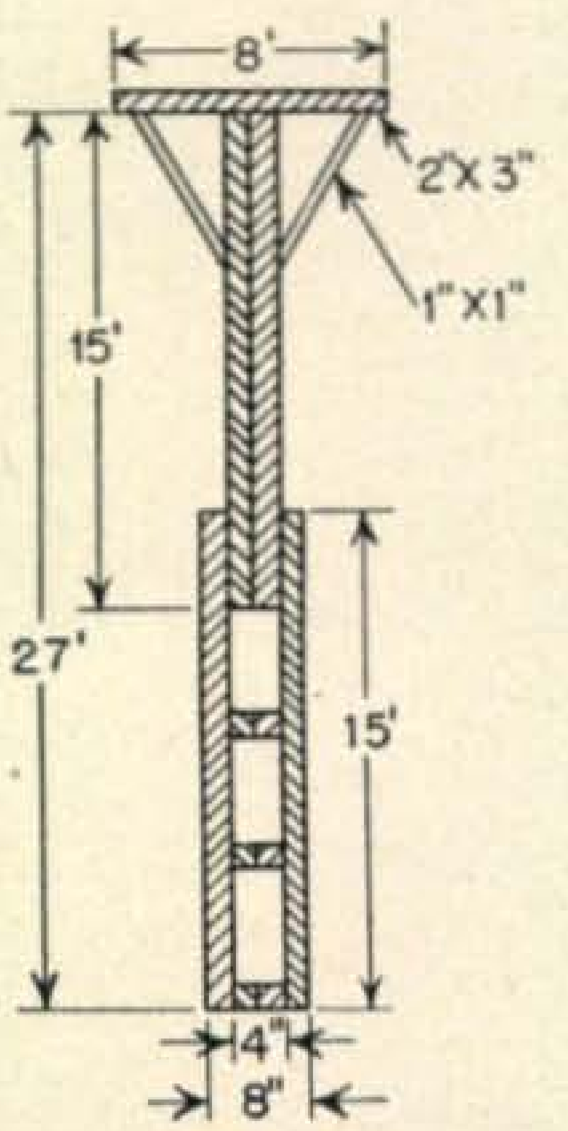
TROMBONE T

[*from page 29*]

Fig. 12. A 3-foot overlap was used between the sections, and a fifth 2 x 3 was sawed up and used as a spacer between the bottom 2 x 3's. Six-inch spikes were used to hold the sections together.

With the help of W2AST, we mounted an 8-foot 2 x 3 in the form of a T on what was to be the top of the mast, nailed on the four 1 x 1 45° supports, mounted the Premax elements by use of Premax No. 492 insulators on the eight-foot 2 x 3, and adjusted the length of the four half elements from the formula:

$$\text{Length of elements (ft.)} = \frac{233.7}{14.1}$$



Note: Dimensions are not to scale.

Fig. 12. Construction details of mast for supporting Trombone T.

The center of the elements comprising the unbroken dipole were butted together, and the centers of the broken dipole (points *A* and *B*) were spaced approximately one inch. The two dipoles were spaced approximately four inches (not critical) and copper straps were soldered to the far ends in such a manner as to maintain the four-inch spacing as at the center. With the additional help of W2IOP and W2RPZ we dragged the mast up to the flat roof (height approximately 18 feet above ground) and with W2RPZ (the fearless one) on the peak of the third floor roof, acting as a human guy wire, the entire structure was walked into place, resting on two 2 x 8s, 36 in. long, which had been placed on the flat roof. While the writer secured the mast to the base, W2IOP climbed a ladder and hammered home the center supports, and W2RPZ then put in the top supports—(all 2 x 3s).

A few words as to its performance. On July 1st, when 14 mc first opened we worked several dozen VKs and ZLs, a few Europeans and VS4JH for his first 14-mc W QSO. Returning from work in the evening we worked Europeans and South Americans by the dozen, ZD8A for WAC postwar, and EP1C for his first W contact on 14 mc.

Classified Ads

Advertising in this section must pertain to amateur radio activities. Rates: 25c per word per insertion for commercial advertisments; 5c per word for non-commercial advertisements by bona fide amateurs. Remittance in full must accompany copy. No agency or term or cash discounts allowed. No display or special typographical ad setups allowed. "CQ" does not guarantee any product or service advertised in the Classified Section. Closing date for ads is the 1st of the month preceding publication date.

AMATEUR radio licenses. Complete code and theory preparations for passing amateur radio examinations. Home study courses. American Radio Institute, 101 West 63rd Street, New York City.

CARTOON QSLs. Cuts. Catalog 10c. Merchant, Box 1592, Rapid City, S. Dak.

CRYSTAL PROCESSING KIT: Includes 4 finished, highly active "BT" crystals; state preference in 5.4 to 8.4 megacycle range; 2 holders, abrasive, instructions, treatise—$1.00 plus postage. Breon Laboratories, Williamsport, Penna.

FCC EXAM samples. We send you exam and correct your answers. Commercial, any class—$2.50, ham—$1.00, per exam. J. R. Johnson, W2BDL, Mount Arlington, N. J.

FOR SALE: Hallicrafters HT-9, also HQ-129-X. Both like new. 1415 Hawthorne, Waterloo, Iowa.

FOR SALE: Best offer takes Hallicrafters SX42 with matching Jensen CRJ-52 de luxe baffle speaker. H. Fisher, 311 Florida Street, Baton Rouge, La.

FOR SALE: Meissner 150-B xmtr with Meissner signal shifter, tubes, and extra spare parts. Might need modulation transformer. $250 or best offer. Buyer must move it. Harvey, W3EMO, 1901—17 St. S.E., Washington, D. C. Lincoln 3588.

FOR SALE: SCR-284—A field transmitter-receiver complete with two antennas, 6 volt battery, trickle charger, generator (hand-crank), dynamotor, vibrator pack, remote control, two mikes, two headsets. Ideal for that ham fest. Best offer gets it. Bob Johnson, 20½ Audubon Place, Tuscaloosa, Alabama.

FOR TRANSMISSION OR TELEVISION lines, it's ¼" RG59/U—73 ohm coaxial cable, special @ 7c/ft. 832 @ $3.50. 3E29 (829B) @ $4.00. Write for information about the completely reconverted SCR-522. Complete line of SCR-522 and other electronic parts. Send your list to Castle Radio Supply, 677 Euclid Avenue, Brooklyn 8, N. Y.

HAMS! Books for hams supplied by mail. Operating, math, UHF, television—all latest titles. Postcard brings free illustrated catalog. D. B. Nephews Publishing Company, 302 Pacific Street, Brooklyn 2, New York.

LATE MODEL NC 101X in excellent condition. Used for lab experiments, previously owned by careful operator. $75 f. o. b. N. Y. CQ, Radio Magazines Inc., 342 Madison Ave., New York 17, N. Y.

QSLs—samples for postage—very reasonable. Bjorn's Print Shop, De Kalb, Illinois.

QSL s . . . Samples for Stamp . . . Henry L. Carter, Jr. . . W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

SELENIUM RECTIFIERS, half wave 5 ampere $4.25, 2¼A $2.25, 1½A $1.85. Full wave 1A $2.50. ½A $1.85. McMurdo Silver amateur and test equipment stocked. Catalog free. Bursma Radio, R5, Grand Rapids 4, Mich.

SELL 60-P Stancor transmitter, complete tubes, crystal, coils. Mr. Joseph, 7814 Narrows Avenue, Brooklyn 9, N. Y.

Super Pro Model-1004 complete broadcast band to 20 mc. Army surplus receiver built with top-notch components throughout. Perfect condition. $185 f. o. b. W2RPZ, 214 Munro Blvd., Valley Stream, L. I., New York.

TELEVISION RECEIVER COIL KITS including complete set of 10 matched coils for 5" or 7" television receiver. Instructions wrapped around each coil include typical circuit application. Kits are shipped prepaid $4.95 each. Vision Research Laboratories, P. O. Box 52, Kew Gardens 15, New York.

TELEVISION RECEIVER easily constructed from our plans. Vision Research Labs announces new line of television booklets written especially for the ham experimenter. Booklets now available ($2.00 each): "Design and Construction of a 7" Television Receiver" and "Visual Alignment Sweep Generator." Booklets contain theory, practical details, illustrations, schematic diagrams, etc. Vision Research Laboratories, P. O. Box 52, Kew Gardens 15, New York.

TRANSFORMER-Raytheon, 509-360-0-360-509v, 290ma (both simultaneously 140/150ma), 375-0-375v, 60ma, 5v, 3a, 5v, 3a, 5v, 3a, 6.3v, 3a $2.75, choke Raytheon 5hy, 150ma, $1.00. HamRad, Bedford, Mass.

UHF MOBILE ANTENNA, feed-through with PL-259 for RG-8U alterable for 5, 2½ or 1¼, $1.00; 5SDG Selsyns, $2.00; SCR-211 Manuals, $1.00; Servo beam rotator, $9.50. Descriptive list 10c. F/H Branch Box 26, Dayton, Ohio.

WANTED: xtal unit complete for National FB7. W1FN, Forrest Adams, White River Jct., Vermont.

WANTED: LM-18 or SCR 211 frequency meter. Cash or trades. Write your needs. List of extras for stamp. Hosea Decker, 44 Campbell St., Delaware, Ohio.

ULTRA MODERN 1 kw phone c-w rig in 7 ft. rack. Has time delay, overload protection, 3 kv 500 ma, 1250 v 400 ma etc. supplies, 5 meters. Like commercial rig. Sell all or any unit. Reason marriage. W2QGR, 104 Russell Avenue, Buffalo 14, N. Y.

2C44 LIGHTHOUSE TUBES. Guaranteed. $2.40 postpaid. Knights, PO Box 583, Trenton 4, N. J.

.7 KW POWER SUPPLY, parts, good surplus, tubes new—$90; unassembled—$70. 304TH PA kit for above power—$70 F.O.B. Stone, 44 Garfield Street, Cambridge, Mass.

Since July 1st we have worked approximately 150 countries, most of them on this antenna.

The antenna loads equally well from 14000 to 14400 and the "soup" really gets up into the radiators. Rain or shine, the plate current to the PA is constant.

A number of the local gang have been so impressed with its performance that they have duplicated the "Trombone T" and are equally pleased with its operation.

For amateur frequencies below 14 mc the tubing elements are not practical. A good folded dipole can be constructed from the 300-ohm parallel twin conductor cable. The twin conductor, should be 95% of one-half wavelength long. just as for any normal antenna flat-top. The ends are shorted, and the half-wave concentric transformer and transmission line is connected at the center as previously described. The weight of the concentric transformer and transmission line may be too much for the twin conductor, and a bamboo pole or other center support to take up the additional weight is suggested.

In all cases the half-wave coax transformer may be coiled up since the field is inside the cable and the coiling will not produce a field, or in any way affect the operation.

A "Trombone T", using twin 300 as a folded dipole, with coax as the matching section and transmission line will not be weather conscious—the loading *will not change* with humidity.

The radiation pattern of the "Trombone T" is the same as a half-wave doublet. However, the feeders are "cold," the operation is unaffected by weather, and the antenna is broad-band.

Appendix A

For the case of a single half-wave dipole of resistance, R_s, with a current flowing of value i_s, the power P_s radiated will be:

$$P_s = [i_s]^2 R_s \qquad (1)$$

For the case of the "folded *n* pole" containing *n* wires, each of equal diameter, one being opened at the center for feeding:

$$P_f = [i_f]^2 R_f \qquad (2)$$

Where the resistance at the feed point $= R_f$
the current in each wire $= i_f$
the power radiated $= P_f$

Since there are *n* wires and the current in each is i_f the total current is (n) (i_f) for the case of the "Folded N pole."

Let
$$P_f = P_s \qquad (3)$$

then
$$i_f = \frac{i_s}{n} \qquad (4)$$

Substituting (1) and (2) in (3)

$$[i_f]^2 R_f = [i_s]^2 R_s \qquad (5)$$

Substituting (4) in (5)

$$\left[\frac{i_s}{n}\right]^2 R_f = \left[i_s\right]^2 R_s$$

or
$$R_f = n^2 R_s$$

CQ Ad Index