CQ

JUNE, 1946

The Radio Amateurs' Journal

25¢



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RME Announces CAL-O-MATIC

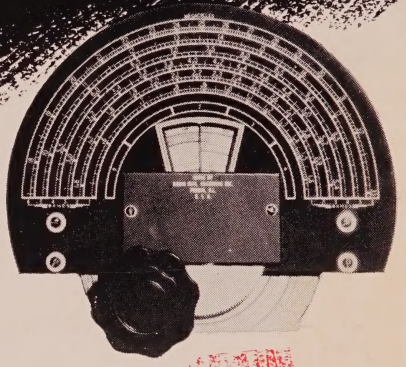
TWO SPEED TUNING

AND

CALIBRATED

BANDSPREAD





CONSTANTLY IMPROVED — BUT NO YEARLY MODELS

In the RME 45 you will now find:

1. Two Speed Tuning. A dual drive mechanism is now provided, in line with the calibrated band spread scale, which gives rapid tuning to cover the band, slow tuning to locate that station. Smooth, effortless, single dial control, calibration on five amateur bands, plenty of spread and real efficiency.

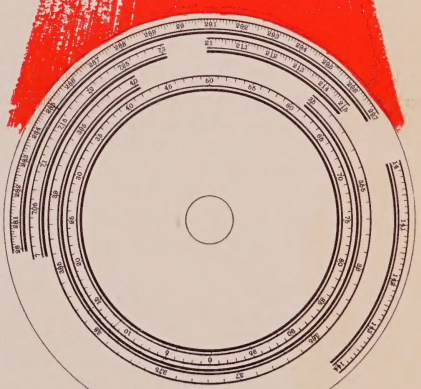
2. Voltage Regulation. Incorporated as an added feature, the RME 45 is now equipped with a VR 150 regulator tube to further reduce any drift to an absolute minimum and to stabilize the overall performance of an already fine instrument. You will like this addition.

3. Improved Noise Limiter. To make operation in a noisy location more enjoyable, a series noise limiter with an ON-OFF switch is being built into the RME 45. It works exceptionally well on all types of interference and goes after the spark-plug type with a vengeance.

Now more than ever, you MUST hear the RME 45 perform!

View of the translucent calibrated bandspread scale.

The two speed dial and calibrated bandspread scale provide the maximum in mechanical and electrical efficiency!



Specification Sheet on Request

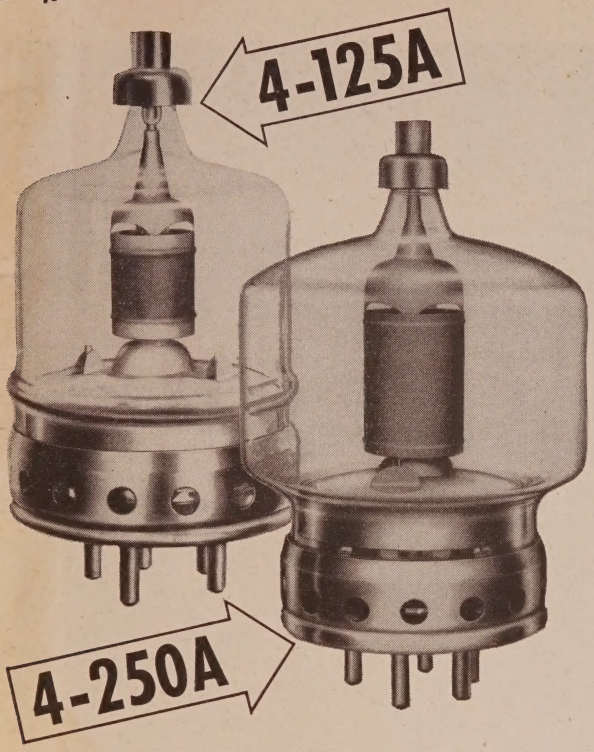
TIME WILL TELL

RME

FINE COMMUNICATIONS EQUIPMENT

RADIO MFG. ENGINEERS, INC.

Peoria 6, Illinois U. S. A.



ONE KILOWATT PHONE	
THE CLASS-C AMPLIFIER	A pair of Eimac 4-250A's
D-C Plate Voltage	2500 volts
D-C Plate Current	400 ma.
D-C Screen Voltage	400 volts
D-C Screen Current	52 ma.
D-C Grid Voltage	-200 volts
D-C Grid Current	22 ma.
Plate Power Input	1000 watts
Plate Power Output	750 watts
Driving Power	5.5 watts
THE MODULATOR	A pair of Eimac 4-250A's
D-C Plate Voltage	2500 volts
Zero-Sig. D-C Plate Current	140 ma.
Max-Sig. D-C Plate Current	400 ma.
D-C Grid Voltage	-80 volts
D-C Screen Voltage	500 volts
D-C Screen Current	-2 ma.
Peak A-F Grid Input Voltage (per grid)	74 volts
Load Impedance, Plate-to-Plate	11,300 ohms
Audio Power Output	500 watts
Driving Power	0
Total Harmonic Dist.	1.6 %

A Kilowatt Phone or CW Rig for Every Amateur

Wartime developments in vacuum tubes put "the kilowatt rig," whether phone or CW, within the reach of every amateur. These two Eimac tetrodes are outstanding examples.

A pair of Eimac 4-125A's will allow a full kilowatt CW input at 2500 volts at all amateur frequencies up to and including the 5-meter band. The two 4-125A's require a total driving power of only 7.2 watts. Neutralization is not necessary.

Amateurs who prefer a single tube in the CW output amplifier will find the Eimac 4-250A to their liking. This new tube will handle a kilowatt input at 3000 plate volts on all amateur bands up to and including the 5-meter band. At one kilowatt input the 4-250A requires a driving power of only 5.8 watts.

For the one-kilowatt phone transmitter the combination of two 4-250A's in the Class-C stage and another pair of 4-250A's in the modulator offers the ultimate in economy of r-f and audio driving equipment. At 2500 plate volts the one-kilowatt Class-C amplifier requires a driving power of only 5.5 watts, while the Class-AB_1 modulator requires zero driving power. The modulator may be driven directly from a resistance-coupled speech amplifier; no "driver" stage is necessary.

Today (Post-War) you can depend upon Eimac for leadership just as you did yesterday (Pre-War). Keep in touch with Eimac—your inquiry incurs no obligation.

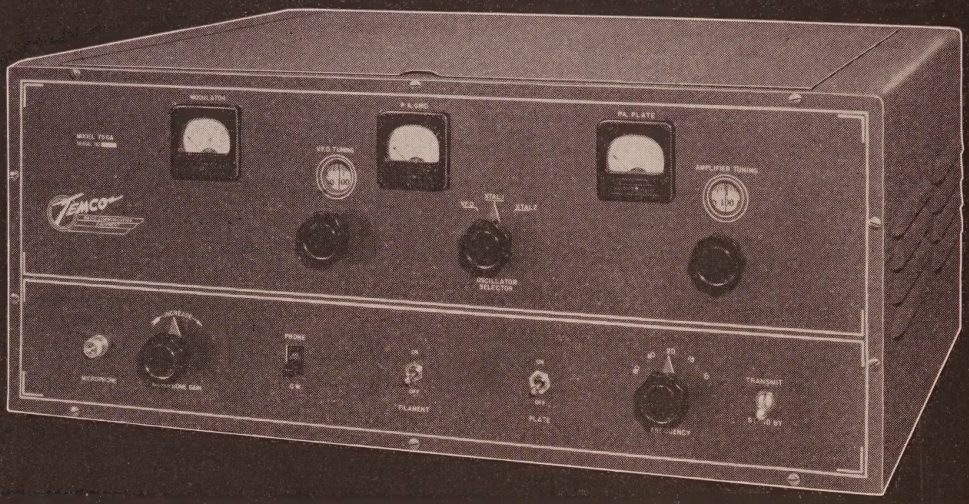
ONE KILOWATT CW		
	A pair of Eimac 4-125A's	One Eimac 4-250A
D-C Plate Voltage	2500 volts	3000 volts
D-C Plate Current	400 ma.	333 ma.
D-C Screen Voltage	350 volts	500 volts
D-C Screen Current	80 ma.	52 ma.
D-C Grid Voltage	150 volts	-200 volts
D-C Grid Current	24 ma.	23 ma.
Plate Power Input	1000 watts	1000 watts
Plate Power Output	750 watts	750 watts
Driving Power	7.2 watts	5.8 watts

FOLLOW THE LEADERS TO

Eimac REG. U. S. PAT. OFF. TUBES

EITEL-McCULLOUGH, INC., 1152 N San Mateo Ave., San Bruno, Calif.
Plants located at: San Bruno, California and Salt Lake City Utah
Export Agents: Frazar & Hansen, 301 Clay St., San Francisco 11, Calif., U.S.A.

More Exciting Facts About The TEMCO 75 GA TRANSMITTER



This new Temco 75/100 watt phone and cw transmitter with multi-frequency VFO and crystal control is causing a sensation, for here at last is the complete rig that puts everything at your fingertips.

It's a typical Temco masterpiece that leads the field in operational simplicity — maximum frequency flexibility and superlative craftsmanship. It covers all 5 amateur bands from 3.5 to 28 megacycles and doesn't require any external equipment to obtain the frequency flexibility needed as greater channel congestion occurs.

All tuning adjustments are at the front and within short reach. Band switching or changing from VFO to crystal control is accomplished with ease. When using crystal control (The 75 GA accommodates two crystal holders) the transmitter becomes a one-dial unit. For telegraph operation, break-in by the grid block method is employed to assure clear-cut, clickless keying. On phone a high impedance crystal or dynamic mike is used and a built-in relay transfers antenna from transmitter to receiver.

The 75 GA is compact yet every component is very accessible for easy servicing and it is as excellent in its engineering design as it is handsome in appearance and construction. The only accessories needed to go on the air are mike, key and antenna.

A most striking feature of the 75 GA is the fact that it is also the exciter unit for a 500 watt output power amplifier. Never before has a complete transmitter been so engineered that it can be utilized in its entirety as an integral unit of an enlarged rig. This means that your initial investment in the 75 GA is good forever and represents a substantial saving when stepping up to higher power. Once and for all, Temco engineers have designed equipment that practically eliminates the factor of obsolescence.

In addition, amateurs who want to convert their present rigs to take in all bands up to 28 megacycles and enjoy the full advantages of frequency flexibility can obtain the VFO and frequency multiplier stages of the 75 GA as a separate unit — complete with its own power supply. This is the heart of the transmitter and is easily one of the best signal shifters ever built. Get the facts today from your dealer or write directly to Temco for full information.

TEMCO
RADIO COMMUNICATION EQUIPMENT

TRANSMITTER EQUIPMENT MANUFACTURING CO., INC.
345 HUDSON STREET, NEW YORK 14, N. Y.

. . . Zero Bias . . .

Portable and Mobile Operation

IN EVERY COMMUNITY where hams have operated, or are operating, portable and mobile, someone among them has been stopped for questioning by law enforcement officials. In some instances, brief interrogation has been the extent of the ham's inconvenience—in other instances he has suffered the embarrassment and indignity of being taken to the police station. A typical example of this took place recently in Brooklyn, N. Y. when W2DIO, net control station operating mobile in a Brooklyn AEC drill, was stopped by a police radio car. Brought to the precinct house for questioning, despite the fact that both his driving license and FCC license were in good order, W2DIO was released promptly largely because of the efforts of another net station, W2OHE. The Brooklyn AEC drills, part of an ambitious and worthwhile program to provide communications for their community in event of an emergency, has been similarly handicapped on previous occasions.

During wartime such vigilance on the part of police was commendable. Today, however, it is an unnecessary nuisance to amateurs and to the police themselves. The problems become very complex after a most perfunctory investigation. Many states and local municipalities have ordinances that prohibit the carrying of any radio receiver capable of picking up police calls. Usually the wording is so loose that an ordinary automobile radio receiver is a technical violation of the law. These statutes were of course not written to hinder the amateur—but if enforced they could prove a grave inconvenience. The fact that a letter from some local official will permit operation, in no way mitigates the injustice of the regulations. Out-of-town hams can scarcely be expected to comply with such local rules that vary throughout the country. The FCC license should be the only authority required to operate within the terms of the Commission's grant to amateurs.

The irony of the situation is the fact that attention is drawn to the ham because of his transmitting equipment, against which there are almost no local ordinances, and not receiving equipment. The overall picture is getting more complicated as new mobile services are licensed, many of which will be in technical violation of the law. One large city even went so far as to suggest that a license, for twenty-five dollars a year, could be obtained to carry a receiver capable of receiving police calls. The legal aspects of this question are beyond the scope of a single editorial, but the law should certainly be clarified to avoid unnecessary repetition of incidents such as those revolving around W2DIO. A ruling by the FCC, and if required, a test case carried through the courts will hasten the revision of some badly written state and local laws, never intended to cover the scope they do.

DX

DX is a wonderful part of amateur radio. Almost every ham at some time in his career wants to work DX . . . and that is the crux of the problem. For every DX station on the air there are countless W's. The spirit of competition is a fine thing, but the spirit of the chase sometimes becomes just a little too much for some of the boys. This has resulted in an increasing number of bitter complaints from DX stations and DX men in the U.S., on poor operating techniques—such as slapping a VFO on a station and calling before a QSO is completed. Admittedly it is good DX technique to call a DX station on the frequency of someone he is finishing up with, but it is only common decency to await completion of all transmissions.

The VFO is only one of many problems facing DX'ers. Band edge operation has resulted in chaos during peak operating hours. Every effort must be made to encourage DX stations and DX operators to utilize the entire band. The real burden lies with the DX stations, for once they start the trend, the W's will follow suit en masse.

While on the subject of DX there is the question of the WAZ award, which is about to be revived. So far we haven't been able to determine whether to run 40 zones as existed prior to the war, or make some change. No action is anticipated until sufficient time has elapsed for all interested parties to speak up—but write in soon, won't you? Lists will be run with pre-war and post-war totals until such time as they are even.



Nothing we can say about overwhelmingly popular "VOMAX" equals what its competent buyers say:

"Will increase your profits . . . measuring every type of receiver voltage. "VOMAX" speeds work to give you more profit." That's mighty sound advice from such experienced distributors as R. G. Sceli & Co., Hartford, Conn., Welch Radio Supply of St. Petersburg, Florida, Radio Products Sales Co., Denver, Colorado.

"Only with 'VOMAX' can you measure every type of voltage in receiver servicing . . . no other instrument gives you this exclusive advantage." So say Arrowhead Radio & Television Supply Co., San Bernardino, Calif., Northwest Radio, Duluth, Minn., Continental Sales Co., Newark, N. J.

"All those vital measurements you've never been able to make before . . . you can now directly measure r.f., i.f., a.f., a.c. . . . visual dynamic signal tracing on operating receivers." So state Universal Radio Supply Co., Louisville, Ky., Radio Parts Co., Milwaukee, Wisc., Ware Radio Supply Co., Brockton, Mass., Evans Radio, Concord, N. H.

"Instantly acclaimed as the standard of comparison . . . carrying our highest recommendation." What more can you ask . . . when it comes from Stan-Burn Radio & Electronics Co., New York and Brooklyn Carolina Radio Equipment Co., Raleigh, N. C., Metropolitan Electronics and Instruments Co., New York, Harvey Radio Co., New York, N. Y.

"Value far above $59.85 cost . . . superb quality of parts, husky construction . . . giveaway price." carries conviction when Mattson's of Richmond, Va. say it.

These and over 500 more SILVER jobbers can supply your "VOMAX" promptly—the instrument the ***factory*** recommends to all BENDIX RADIO distributors and dealers—the instrument the authorities use.

"VOMAX"

Measures **EVERY** Voltage

1. Brand new post-war design . . . positively not a "warmed-over" pre-war model.
2. More than an "electronic" voltmeter, VOMAX is a true vacuum tube voltmeter in every voltage resistance db. function.
3. Complete visual signal tracing from 20 cycles through over 100 megacycles by withdrawable r.f. diode probe.
4. 3 through 1200 volts d.c. full scale in 6 ranges at 5Ω, and in 6 added ranges to 3000 volts at 12Ω megohms input resistance. Plus-minus polarity reversing switch.
5. 3 through 1200 volts a.c. full scale in 6 ranges at honest effective circuit loading of 6.6 megohms and 8 mmfd.
6. 0.2 through 2000 megohms in six easily read ranges.
7. − 10 through + 50 db. (0 db. = 1 mw. in 600 ohms) in 3 ranges.
8. 1.2 ma through 12 amperes full scale in 6 d.c. ranges.
9. Absolutely stable—one zero adjustment sets all ranges. No probe shorting to set a meaningless zero which shifts as soon as probes are separated. Grid current errors completely eliminated.
10. Honest, factual accuracy: ±3% on d.c.; ±5% on a.c.; 20∼ through 100 megacycles; ±2% of full scale, ±1% of indicated resistance value.
11. Only five color-differentiated scales on 4½" D'Arsonval meter for 51 ranges (including d.c. volts polarity reversal) eliminate confusion.
12. Meter 100% protected against overload burnout on volts/ohms/db.
13. Substantial leather carrying handle. Size only 12¾" x 7⅜" x 5⅜".

Send postcard for free catalog of measurement and communication equipment.

OVER 35 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McMurdo Silver Company

1240 MAIN STREET, HARTFORD 3, CONNECTICUT

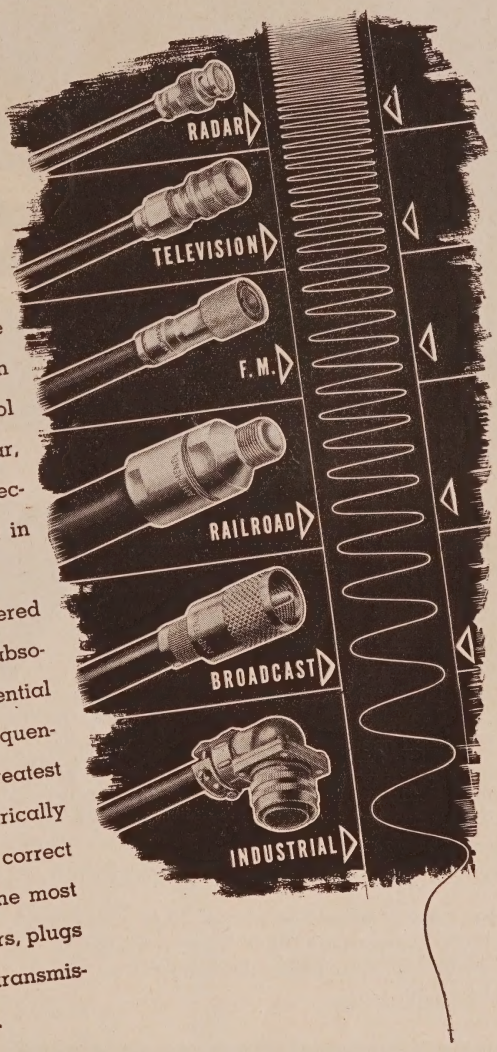
AMPHENOL

Covers the Spectrum

WITH CABLES AND CONNECTORS FOR EVERY FREQUENCY

Amphenol serves the electrical and electronic industries with the most complete line of cables, connectors, plugs and fittings for every application. No matter what the need — from high-current, low-voltage cables and connectors such as are used in power lines, to high-voltage, high-frequency components required in the upper regions of the spectrum—there is an Amphenol product for the job. Amphenol cables and connectors are used in Radar, F.M., Television, Standard Broadcast, electronic controls and equipment . . . and in numerous industrial applications.

Amphenol connectors are engineered and constructed so as to afford the absolute minimum of loss of power, potential or waveform even at the highest frequencies. These components reflect the greatest advancement in all phases of electrically correct design and mechanically correct manufacture. Amphenol makes the most complete line of cables, connectors, plugs and fittings for the most efficient transmission of power at all frequencies.



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



Get the *most* out of your transmitter with the *foremost* crystals—tops in "techniquality" for over 15 years.

In type AX2 *plated* crystals Bliley craftsmen have chalked up another "first" in creative engineering.

Designed specifically for the 80-40-20 meter bands, type AX2 *plated* crystals boast a long list of technical accomplishments, most important of which are *better grid current stability over a wide temperature range*, plus, *improved frequency stability under high drive conditions.*

For better transmitter performance, you'll want to know more about Bliley Type AX2 *plated* crystals. Ask your Bliley distributor for Bulletin 30.

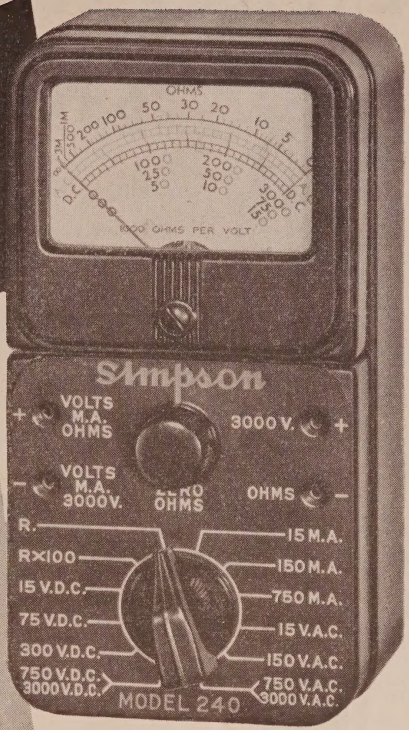
Bliley CRYSTALS

Type AX2 units, 80-meter band $2.80 Ea.
Type AX2 units, 40-meter band $2.80 Ea.
Type AX2 units, 20-meter band $3.95 Ea.

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA



...Get back on the Air-



SAVE CONSTRUCTION HOURS BE SURE AS YOU BUILD

The Simpson Model 240 was introduced in 1939. In the two short years before "Hams" went off the air, this remarkable general service instrument built itself such a reputation that the demand for it has never ceased. During the war it was supplied to the Services in limited quantities. It has undergone steady improvement as the result of test and research. Now we can offer it to you again, a vastly better instrument than before—and it was always a sensational instrument.

Completely self-contained, needing no external multipliers, with a sensitivity of 1000 ohms per volt and a maximum voltage of 3000 volts A.C. or D.C., it has all the variety of useful ranges needed to do an all-around job for you.

The 3-inch meter has a scale over ⅓ greater than before, offers greater accuracy in reading. The whole chassis is encased in heavy molded bakelite. All components and the sub-panel are mounted directly on the bakelite panel for easy servicing and greater sturdiness. All figures are engraved and filled with white enamel for greater legibility and wearing qualities.

Shock-proof, it has the famous Simpson movement with bridge-type construction and soft iron pole pieces, resistors in matched pairs to provide greatest possible accuracy for all ranges. It is furnished with test leads whose wire covering is capable of withstanding 3000 volts. Alligator clips have safety rubber guards.

Here is the instrument that will get you on the air and keep you there, helping you to build soundly and to trouble-shoot speedily and surely.

The New Simpson Model 240— The "Hammeter" — 1946 version of the first self-contained pocket portable instrument built expressly to check high voltage and all component parts of transmitters and receivers.

RANGES

VOLTS
A. C.
0-15
0-150
0-750
0-3,000

VOLTS
D. C.
0-15
0-75
0-300
0-750
0-3,000

MILLIAMPERES
D. C.
0-15
0-75
0-300
0-750

Ohms: 0-3,000 (center scale 30)
0-300,000 (center scale 3,000)

Price, complete with test leads..$26.50

Ask Your Jobber

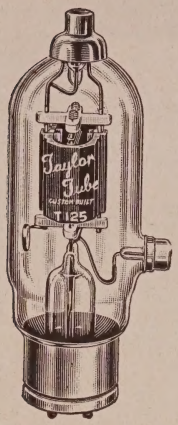
SIMPSON ELECTRIC CO.
5200-5218 W. Kinzie St., Chicago 44, Ill.

Simpson

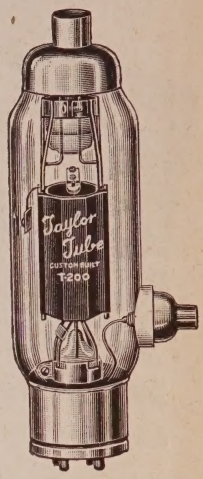
INSTRUMENTS THAT STAY ACCURATE

EASIEST-LOW COST WAY FOR

½ KW to 1 KW



A single T-125 or T-200 operating at 2000 volts with only 15 watts drive gives you a fine performing, economical 500 watt phone or CW Rig. With 2000 volts, your associate equipment costs are lower—less space is required—and efficiency is high on all frequencies from 10 meters through 80 meters.



If you want a Power-house Kilowatt, use T-123's or T-200's in push-pull. They take the KW easily at 2000 volts with low drive and high efficiency. You'll save money, space and get better results.



Modulate your high-power Rig with 203Z's or 805's. They are designed for Class B audio work and prove it by their fine operation.



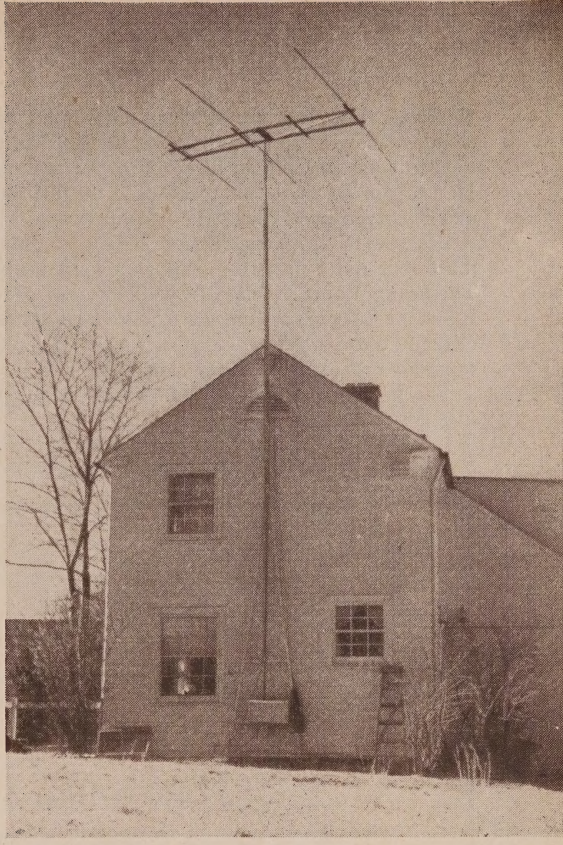
Of course, you will use the famous Taylor 866A rectifiers in your power supplies.

For More Output at Lower Voltages Use TAYLOR TUBES

Remember
"MORE WATTS PER DOLLAR"

Taylor HEAVY CUSTOM BUILT DUTY Tubes

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



W8LO's antenna and mast ready to operate. Relatively little construction work must be done on the house itself. The mast in the horizontal position makes adjustments simple on the beam without going through the usual gymnastics

J. ALAN BIGGS, W8LO

Versatile ROTARY BEAM SUPPORT

THE biggest problems confronting the ham who plans a rotary beam are the kind of mast to use, and how the antenna will be tuned after it is mounted in place. The method used at W8LO/2 has attracted much interested comment. Since it can be constructed and raised by one man alone, it seems worthwhile passing along.

The mast is no more than the old standby "A" frame, made somewhat stronger by using a 3 x 4 for the upper and 2 x 4's for the lower sections. Along the full length is a drive shaft made of two ten foot lengths of $\frac{3}{4}$" pipe and one twelve foot length. Suitable couplings and a flange, to which the beam is screwed, are drilled and pinned. The pipe rotates in one inch pipe clamps which are spaced about four feet apart along the 3 x 4 section. The butt of the lower pipe has a cap on it which rests in a bearing made by drilling a hole $\frac{1}{2}$" deep in a short piece of 2 x 4 which is in turn bolted to a lower cross member of the "A" frame. The antenna turns surprisingly freely, even in a high wind, by grasping the pipe while standing on the ground.

With the beam mounted the entire mast is pulled up to the peak of the house, using a three-strand block and tackle made with heavy woven cotton clothes line. Half-inch hemp line, if obtainable, should be used in place of the clothes line.

A block made from a piece of 2" x 8" with a notch cut in it to fit the 3 x 4 of the frame is bolted to the peak of the house and serves as a rest for the mast at that point. The original plan was to climb a ladder and hook the pole into the socket in this block with a heavy fence hook. However, with all the times it has been raised and lowered during the past winter in order to make changes in the antenna this was never done. The mast has stayed up during some high winds with no annoying bumping by merely tying the clothes line to a nearby fence post.

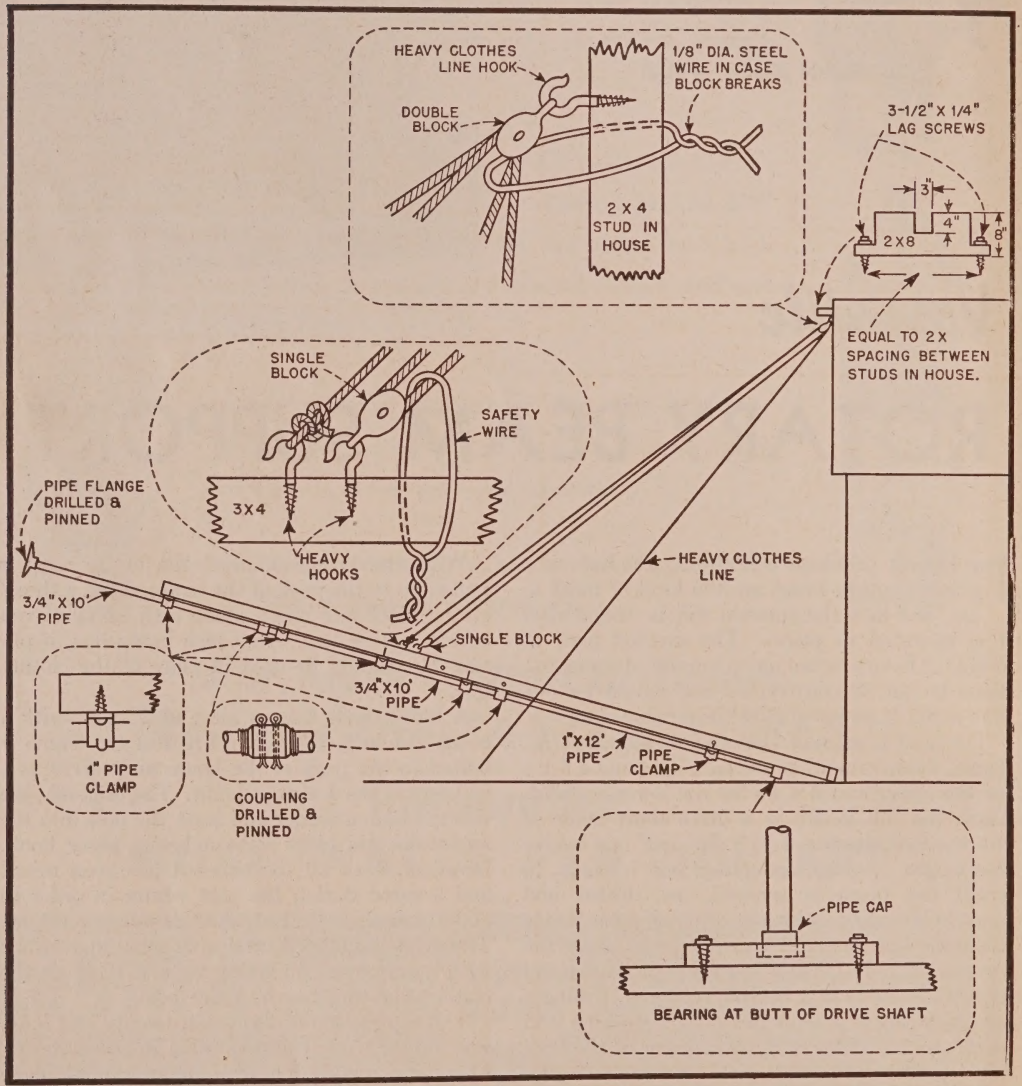
The top section of the mast, twenty feet long, was moved from a former QTH in South Jersey where it supported a $2\frac{1}{2}$ meter ground plane antenna during the war years until September 1945. A similar block and tackle arrangement

was used there but without an "A" frame. Instead, the lower end was hinged to the side of the house at a point fifteen feet above the ground. Here again no hook was ever used at the top, and it stayed up through the last hurricane! ! !

Because of the construction of the antenna mast it is quite important to use a light beam. The beam in operation at 8LO is illustrated. The frame has been used for two, three, and four element ten meter beams, using ½" x ½" rectangular cross-section dural elements.

The principal advantages offered by this type of mast construction are:

1. With the mast lowered and the beam turned so that the elements are vertical to, but clearing the ground a few inches, the antenna may be tuned and adjusted as though it were horizontal and several half waves high. This has been proved in practice and is also shown by an examination of the radiation resistance curves for vertical and horizontal half-wave antennas.
2. The beam may be assembled, altered, tuned, raised or lowered without climbing anything higher than a step ladder after the block is once fastened to the peak of the house.
3. The beam may be positively rotated from the ground or a rotating mechanism may be added later at ground level. Its weight or

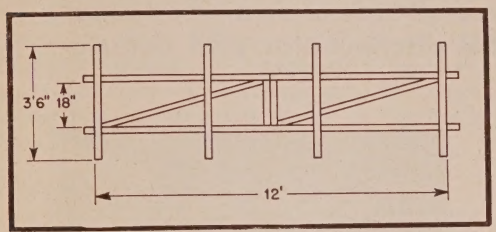


General details of the overall assembly at W8LO. The safety wires are suggested to prevent the antenna being damaged should one of the blocks break or the hooks pull out

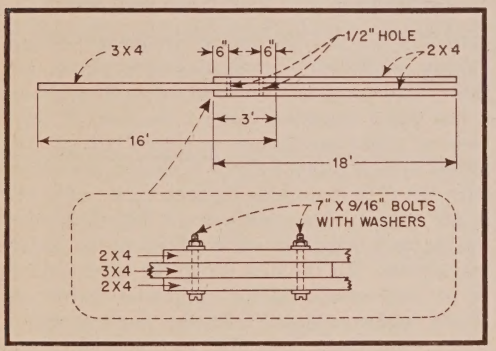
the wind resistance it may offer, are no problems.

4. Ease of servicing rotating mechanism.
5. Simplicity and economy of construction.

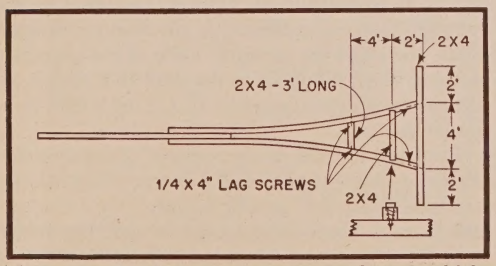
When manually operating the beam it is perfectly feasible to couple a selsyn indicator to the base of the mast. This will give direction indication in the shack without the necessity of guessing. It is important to remember that the indicator should be plainly viewed while in a position to turn the mast. If electrical drive is used, the selsyn indicator can be located at the operating position. Using the beam with no direction indicator will place the operator at a decided disadvantage.



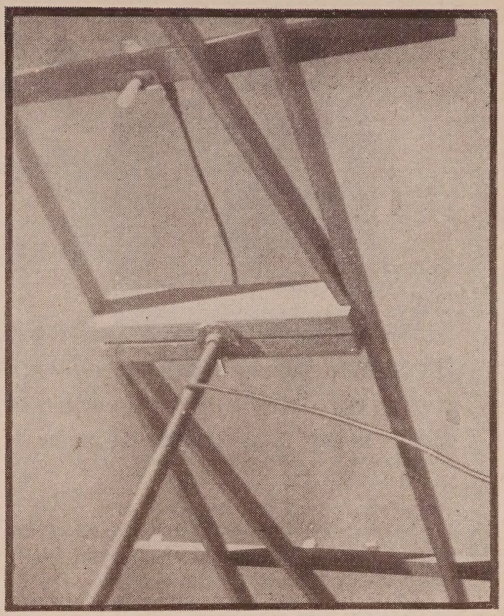
Well seasoned 1" x 2" clear grained wood is used throughout with the exception of the center cross pieces which are 2 x 4 pieces on which the pipe flange is fastened. Lead holes drilled in all pieces prevents splitting when fastening together with 2½" brass wood screws



Plan of mast looking from thin side. If possible hardware should be of non-rusting variety. Best materials available should be used for construction in order to minimize weathering



Mast viewed in horizontal position. Care should be taken when raising and lowering the mast to prevent undue strain



Detail of pipe flange where it fastens to rotary support

W8LO demonstrates the advantages of his highly maneuverable mast. Elements just clear ground



CRYSTAL DIODES
And How To Use Them

ROBERT L. ROD, W2KVY

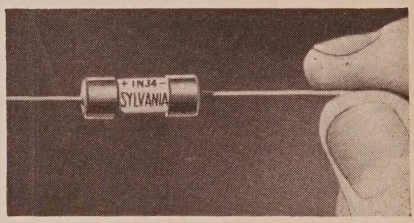
Something for nothing just about sums up the new crystal diode. Designed to replace power-consuming diode vacuum tubes in many applications, it is suited for a multitude of diversified circuits, from field strength indicator to FM discriminator and detectors.

OVER A SCORE of years ago amateurs engrossed themselves delving into the many and varied complications of receivers designed around the rectifying properties of odd pieces of crystalline substances which, when probed at some particularly sensitive spot with a wire "cats-whisker," responded as elementary diode detectors. These simple crystal receivers were outmoded by modern advances in vacuum tubes which offered more reliability and efficiency to the science of radio reception.

In present-day applications at the usual communications frequencies, the vacuum tube diode is satisfactory for use as a diode detector since it presents a high impedance in one direction and a low impedance in the other to alternating current flow. The adverse effects of noise voltages and inter-electrode reactances are normally sufficiently negligible to be discounted until one embarks on a program of higher-frequency operations. However, at these higher frequencies, generally above a hundred megacycles, the inter-electrode capacities of conventional vacuum tube diodes enter the picture due to their extreme signal shunting effect. In addition, the signal-to-noise ratio falls, and with conventional tubes, one is practically forced to forgo the advantages of the superheterodyne principle.

Crystal Diode

A new development in diodes is the crystal diode rectifier which, although it is a distant relative of the early "cat's-whisker" version, has been considerably improved over the span of years to the point where one version has taken its place as the most efficient superheterodyne mixer for super-high-frequency receivers and another is excellent for use in low power diode circuits at normal frequencies. The new crystal



Crystal diode is no larger than a small resistor

detectors are not the quartz frequency control variety exhibiting the piezo-electric effect, but rather they are small sealed-in units, each having a fine point tungsten contact touching a small piece of either germanium or silicon crystal. The former type is generally used in circuits associated with the 6H6 duo-diode vacuum tube, while the latter type is best utilized for high-frequency mixing and detecting applications up to 25,000 megacycles. In the new form, the crystal diode is, in one version, factory adjusted and is enclosed within a small cartridge having pigtail leads to facilitate placement into any circuit requiring a diode rectifier of moderate power capabilities.

Electrically, the crystal diode is most efficient and is in practically all respects superior to its vacuum tube equivalent. A germanium crystal diode, the 1N34 for example, has a shunt capacity of 3 $\mu\mu$f when mounted in its place in a circuit as compared to approximately 15 $\mu\mu$f for a 6H6 in a similar position.

Since the crystal diode requires absolutely no heater or filament power, a corresponding saving is effected on the power supply requirements, and from a space standpoint it will be noted from the photograph that the crystal illustrated is hardly bigger than a standard half-watt carbon resistor. A comparison between some of the

electrical ratings of a typical diode vacuum tube, one-half of a 6H6 for example, and those of the Sylvania 1N34, a germanium crystal diode, proves of interest:

	6H6	*1N34*	
Heater power	1.89	0	watts
Peak inverse voltage	420	50	volts
Peak plate current	48	60	ma
Average plate current	8	22.5	ma
Shunt capacity in actual circuit position, approx.	15	3	$\mu\mu f$

In the above characteristics, one might at first be disappointed when noting the low peak inverse voltage rating of the germanium crystal unit. However, in normal second detector and FM discriminator circuits, it is rare that the impressed a-c diode voltage exceeds the 50 volt maximum specified. In the event that the input to the diode exceeds this value, a suitable voltage divider can be utilized to lower the rectifier's input voltage.[1]

Diode Circuits

Fig. 1a and *Fig. 1b* illustrate two commonly encountered circuits, the diode detector and the FM frequency discriminator, in which germanium crystal diodes of the 1N34 type can be utilized to advantage. For the adequate reproduction of the modulation, the values of C and R in each case are selected so that the condensers are discharged through the load resistance in less

[1] Two or more crystal diodes in series can be used if the maximum input voltage rating would otherwise be exceeded.

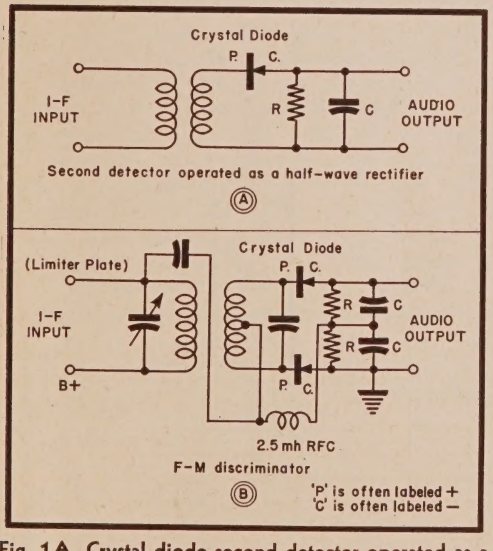


Fig. 1A. Crystal diode second detector operated as a half-wave rectifier

Fig. 1B. Crystal diodes operated as F-M discriminator

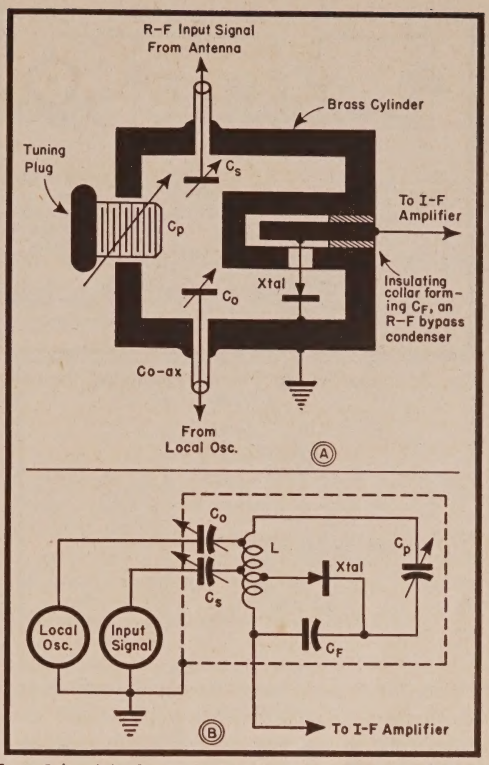


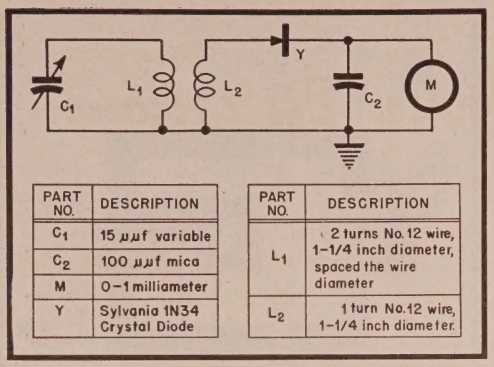
Fig. 2A. Mechanical details of a resonant cavity crystal mixer

Fig. 2B. Electrical equivalent of resonant cavity crystal mixer

than one-half cycle of the highest modulation frequency being used. It is well to mention at this point that any fully charged condenser will completely discharge through a resistance in a time, in seconds, equal to approximately five times the time constant or five times the product of the capacity of the condenser, in farads, by the resistance, in ohms. As an example, it can be calculated that a fully charged 0.0001 μf condenser, C, will completely discharge (or charge, as the case may be) through a 10,000 ohm resistance, R, in five millionths of a second or five microseconds, computed as follows:

$$\text{Discharge Time} = 5(0.0001 \times 10^{-6})(10{,}000)$$
$$= 5 \times 10^{-6} \text{ seconds}$$
$$= 5 \text{ microseconds}$$

If the same condenser-resistor combination is to be used in either of the above circuits (*Fig. 1a* and *1b*), C must be fully discharged in less than one-half cycle of the highest modulation frequency being used. Therefore the value of this maximum frequency is fixed by the calculated discharge time of the components C and R, and by another calculation the upper frequency limit is set at 100 kilocycles:



PART NO.	DESCRIPTION
C_1	15 μμf variable
C_2	100 μμf mica
M	0–1 milliameter
Y	Sylvania 1N34 Crystal Diode

PART NO.	DESCRIPTION
L_1	2 turns No.12 wire, 1–1/4 inch diameter, spaced the wire diameter
L_2	1 turn No.12 wire, 1–1/4 inch diameter.

Fig. 3. Crystal diode 144 mc absorption frequency meter

$$f = \frac{1}{T}$$
$$= \frac{1}{10 \times 10^{-6}}$$
$$= 100{,}000 \text{ cycles}$$
$$= 100 \text{ kilocycles}$$

where T = One complete sine-wave period in seconds
f = Maximum modulation frequency in cycles

Note that since the *C-R* combination must be discharged in 5 microseconds or in one-half cycle, the period of one complete sine wave equals 10 microseconds.

Another version of the crystal diode finds application in the mixer stages of microwave superheterodynes, but instead of using the germanium crystals previously discussed in connection with standard frequency discriminator and detector circuits, silicon crystals are employed. Since many amateurs are now experimenting in the microwave regions, an application of the silicon crystal diode will briefly be discussed.

Resonant Cavity Crystal Mixer

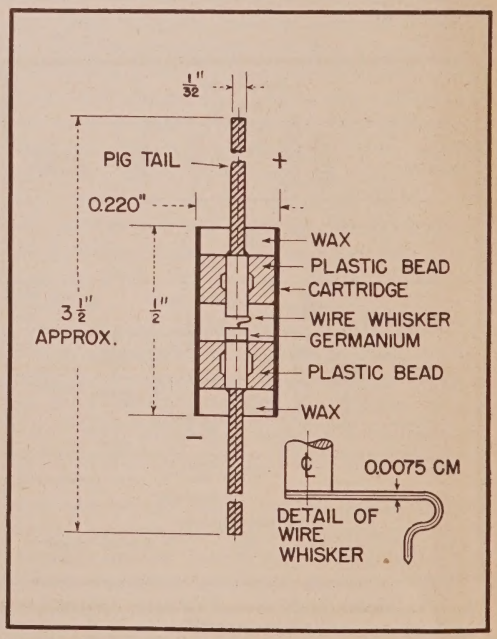
The physical size of any L-C resonant circuit decreases as the frequency increases, until at several hundred megacycles in order to sustain oscillations the actual inductance often decreases in size until it manifests itself not as a coil but as the inductance of the circuit's wiring. The capacity also decreases until a point is reached where the inter-electrode capacities of the tubes being used are sufficient to resonate the circuit. The smaller these inter-electrode capacities are, the higher the frequency goes for any one inductance. In addition, since conventional tubes are prone to shunt a goodly amount of signal to ground through these capacities, engineers have been forced to devise new devices capable of more satisfactory higher-frequency operation, preferably utilizing the superheterodyne principle whenever possible.

One such device is a resonant cavity crystal mixer which performs the same function as a conventional superheterodyne mixer or converter circuit. The cavity, as illustrated in *Fig. 2a*, is a modified metal cylinder tuned to the frequency of an r-f input signal applied to the interior through a probe (or miniature antenna), C_s. Cavity tuning is accomplished by varying the physical length of the cavity's interior by means of a threaded screw-in plug, C_p; an operation analogous to the tuning of the electrical equivalent circuit of the cavity by means of C_p, in *Fig. 2b*.

The resonant cavity is mentioned, because it utilizes a silicon crystal diode to mix the r-f input signal from the antenna with an externally generated local oscillator signal (which is also injected into the cavity by means of another probe, C_o). As is customary, the frequency of the local oscillator differs from the r-f input signal by the receiver's i-f frequency. By the action of the crystal diode, which is placed inside the cavity at a voltage maximum point, the two input signals are combined to produce an output consisting of current components of the usual sum difference frequencies as well as harmonics and the fundamentals of the signals themselves.

With such a cavity arrangement, using a local oscillator tube of the RCA 2C43 "Lighthouse" variety and a crystal diode of the 1N23 type, the amateur can easily construct a good thousand megacycle superheterodyne. Although the gain

[*Continued on page 63*]



Constructional details of germanium type crystal diode

Why Not Use Your Distortion?

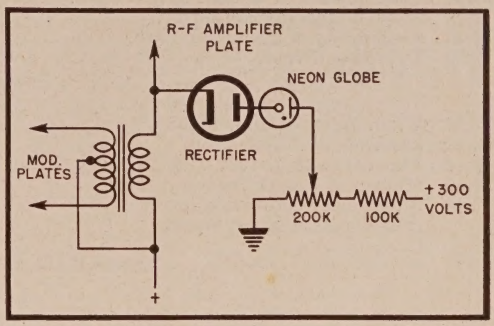
BEN A. PENNERS, W7HLV

If you must have distortion here's a trick method which increases modulator power while giving a cleaner signal.

When compared to a sine wave, the male voice is found to contain a certain percentage of even order harmonics. This is because the male vocal equipment finds it easier to compress air than to rarefy it. Obviously male voices may vary from person to person and there is no way to tell what yours may be. Addition of second, and other even order harmonics gives rise to a wave form like that of *Figs. 1* and *2*. These figures show the wave to have a greater amplitude in one direction than another. If the speech amplifier is linear, this wave form will be preserved, and the modulating wave will have the same shape, although it may be inverted in the process of amplification.

When a class A voltage amplifier handles a large signal it is very apt to be driven so that it causes second harmonic distortion. Phase inverters also cause second harmonic distortion, and although the author does not propose that distortion be added, there is a direct benefit to be gained by phasing your distortion.

When an r-f carrier is amplitude modulated, the audio voltage, called (E_m), is impressed on the d-c voltage, called (E_b), which is supplied to the r-f amplifier plate circuit. The absolute value of (E_b) will vary during the modulation cycle from values of (E_b) + ($+E_m$) on the positive peak to (E_b)-(E_m) on the negative peak. If the modulating voltage is sinusoidal the exact value of ($-E_m$) and ($+E_m$) will be equal. When ($+E_m$ equals (E_b) the plate voltage will be doubled, and when ($-E_m$) equals (E_b) the plate voltage will

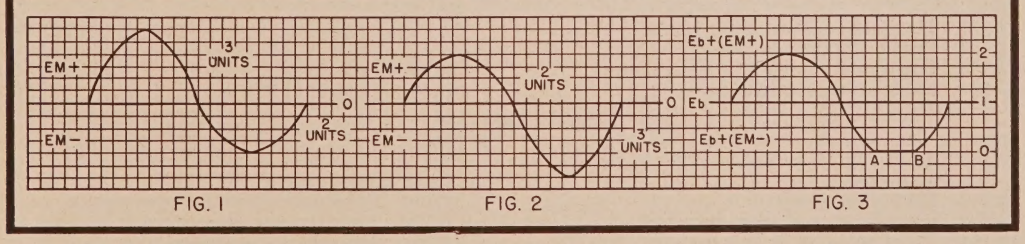


Method of monitoring for negative peaks without aid of oscilloscope

be zero. This is the condition for 100% modulation with sine wave modulation. If the modulating wave has the shape of *Fig. 2*, and ($+E_m$) equals (E_b) the value of ($-E_m$) will exceed (E_b) with the result as shown in *Fig. 3*, in this case the carrier will be cut off from *A* to *B*, and there will be splattering from the carrier cutoff. If, however, the wave form is turned over the highest peak will be extended in the positive direction, and the resultant side band distortion will be greatly decreased. From this it is seen that ($-E_m$) must not exceed (E_b) if you expect to live at peace with your fellow hams.

The speech amplifier and modulators at W7HLV/6 have been checked and rearranged to take advantage of all the unavoidable distortion, the effect has been to give an average in-

[*Continued on page 62*]



Addition of second and other even order harmonics will result in wave form as illustrated in *Figs. 1* and *2*. Condition of splatter *Fig. 3*, is fully explained in text

FCC RULES GOVERNING AMATEUR RADIO SERVICE

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Definitions

Sec. 12.1 Amateur Service.—The term "amateur service" means a radio service carried on by amateur stations.

Sec. 12.2 Amateur operator.—The term "amateur operator" means a person interested in radio technique solely with a personal aim and without pecuniary interest, holding a valid license issued by the Federal Communications Commission authorizing him to operate licensed amateur stations.

Sec. 12.3 Amateur station.—The term "amateur station" means a station used by an amateur operator, and it embraces all radio transmitting apparatus at a particular location used for amateur service and operated under a single instrument of authorization.

Sec. 12.4 Amateur portable station.—The term "amateur portable station" means an amateur station that is so constructed that it may conveniently be moved about from place to place for communication, but which is not operated while in motion.

Sec. 12.5 Amateur mobile station.—The term "amateur mobile station" means an amateur station that is so constructed that it may conveniently be transferred to or from a mobile unit or from one such unit to another, and is ordinarily used while such mobile unit is in motion.

Sec. 12.6 Amateur radio communication.—The term "amateur radio communication" means radio communication between amateur stations solely with a personal aim and without pecuniary interest.

AMATEUR OPERATORS

Licenses—Privileges

Sec. 12.21 Eligibility for license.—The following are eligible to apply for amateur operator license and privileges:

Class A.—Any citizen of the United States who within five years prior to receipt of his application by the Commission has held, for a period of a year or more, an amateur operator license issued by the Commission.

Class B.—Any citizen of the United States.

Class C.—Any citizen of the United States whose actual residence, address, and amateur station are more than 125 miles airline distant from the nearest location at which examinations are held at intervals of not more than three months for class B amateur operator license; or who is shown by physician's certificate to be unable to appear for examination because of protracted disability; or who is shown by certificate of the commanding officer to be in the armed forces of the United States at a military, naval or Coast Guard station and, for that reason, to be unable to appear for examination at the time and place designated by the Commission.

Sec. 12.22 Application for amateur operator license.—Each application for amateur operator license shall comply with the Commission's Rules and Regulations and shall be made in writing on Form 610 (application for amateur operator and/or station license). The application shall be filed with the district field office of the Commission if personal appearance is required for operator examination. If personal appearance is not required, the application shall be sent instead to the Commission, Washington 25, D.C. All applications for class Cooperating privileges shall be sent to the Commission, Washington 25, D.C.

Sec. 12.23 Classification of operating privileges.—Amateur operating privileges are classified as follows:

Class A.—All authorized amateur privileges.

Class B or C.—All authorized amateur privileges except the use of type A-3 emission on the frequency bands to 3900 to 4000 kc and 14150 to 14250 kc.

Sec. 12.24 Scope of operator authority.—Amateur operator licenses are valid only for the operation of licensed amateur stations; and, on a temporary basis, for the operation of experimental stations (except class 2 stations) in the experimental service licensed for operation exclusively on a frequency or frequencies above 450 Mc if such services are performed without compensation, direct or indirect, paid or promised.

Sec. 12.25 Availability of operator license.—The original operator license of each operator shall be kept in the personal possession of the operator while operating an amateur station. When operating an amateur station at a fixed location, however, the license may be posted in a conspicuous place in the room occupied by the operator. The license shall be available for inspection by any authorized government official whenever the operator is operating an amateur station and at other times upon request made by an authorized representative of the Commission, except when such license has been filed with application for modification or renewal thereof, or has been mutilated, lost, or destroyed, and application has been made for a duplicate license in accordance with section 12.26. No recognition shall be accorded to any photo-copy of an operator license.

Sec. 12.26 Duplicate license.—Any licensee applying for a duplicate license to replace an original which has been lost, mutilated, or destroyed, shall submit with the application the mutilated license or a statement setting forth the facts regarding the manner in which the original license was lost or destroyed. If, subsequent to receipt by the licensee of the duplicate license, the original license is found, either the duplicate or the original license shall be returned immediately to the Commission.

Sec. 12.27 Renewal of amateur operator license.—An amateur operator license may be renewed upon proper application showing that within the last six months of the license term the licensee has lawfully operated an amateur station or stations licensed by the Commission, and has thereby communicated by radio telegraphy with at least three other such amateur stations in the United States. The applicant shall qualify for a new license by examination if the requirements of this section are not fulfilled. Application for renewal of an amateur operator license shall be filed not more than 120 days prior to date of expiration of such license and not later than the date of expiration.

Sec. 12.28 Who may operate an amateur station.—An amateur station may be operated only by a person holding a valid amateur operator license, and then only to the extent provided for by the class of privileges granted under the license. When an amateur station is used for telephony, the station licensee may permit any person to transmit by voice, provided that during such transmission call signals are announced as prescribed by section 12.82 and a duly licensed amateur operator maintains actual control over the emissions, including turning the carrier on and off for each transmission and signing the station off after communication with each station has been completed.

Sec. 12.29 License term.—An amateur operator license is valid normally for a period of 5 years from the date of issuance of a new, renewed, or modified license.

Sec. 12.30 Order of suspension.—No order of suspension of any operator's license shall take effect until 15 days' notice in writing thereof, stating the cause for the proposed suspension, has been given to the operator licensee who may make written application to the Commission at any time within said 15 days for a hearing upon such order. The notice to the operator licensee shall not be effective until actually received by him, and from that time he shall have 15 days in which to mail the said application. In the event that physical conditions prevent mailing of the application at the expiration of the 15-day period, the application shall then be mailed as soon as possible thereafter, accompanied by a satisfactory explanation of the delay. Upon receipt by the Commission of such application for hearing, said order of suspension shall be held in abeyance until the conclusion of the hearing which shall be conducted under such rules as the Commission shall deem appropriate. Upon the conclusion of said hearing the Commission may affirm, modify, or revoke said order of suspension.

Sec. 12.31 Proceedings.—Proceedings for the suspension of an operator's license shall in all cases be initiated by the entry of an order of suspension. Respondent will be given notice thereof together with notice of his right to be heard and to contest the proceeding. The effective date of the suspension will not be specified in the original order but will be fixed by subsequent motion of the Commission in accordance with the conditions specified above. Notice of the effective date of suspension will be given respondent, who shall send his operator license to the office of the Commission in Washington. D C., on or before the said effective date, or, if the effective date has passed at the time notice is received, the license shall be sent to the Commission forthwith.

Examinations

Sec. 12.41 When examination is required.—Examination is required for the issuance of a new amateur operator license, and for a change in class of operating privileges. Credit may be given, however, for certain elements of examination as provided in section 12.46.

Sec. 12.42 Elements of examination.—The examination for amateur operator privileges 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 1 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.

Sec. 12.43 Elements required for various privileges.—The examination for class A privileges will include all of the examination elements specified in section 12.42.

The examination for class B and class C privileges will include elements 1, 2, and 3 specified in section 12.42.

Sec. 12.44 Manner of conducting examination.—The examinations for class A and class B privileges will be conducted by

an authorized Commission employee or representative at locations and at times specified by the Commission.

Each examination for class C privileges will be conducted and supervised by not more than two volunteer examiners, whom the Commission may designate or permit the applicant to select; in the event the examiner for the code test is selected by the applicant, such examiner shall be the holder of an amateur operator license with class A or B operating privileges, or shall have held, within the 5 years prior to the date of the examination, a commercial radiotelegraph operator license issued by the Commission or within that time shall have been employed in the service of the United States as the operator of a manually operated radiotelegraph station. The examiner for the written test shall be at least twenty-one years of age.

Sec. 12.45 Additional examination for holders of class C operating privileges.—The Commission may require a licensee holding class C operating privileges to appear for a class B examination at a location designated by the Commission. If the licensee fails to appear for the class B examination when directed to do so, or fails to pass such examination, the class C operator licensee previously issued shall be subject to cancellation and, upon cancellation, a new license will not be issued for the class C privileges.

Whenever the holder of class C amateur operating privileges changes his actual residence or station location to a location where he would not have been eligible to apply for class C privileges in the first instance, or whenever a new examining location is established in an area within which the holder of class C amateur operating privileges would not have been eligible because of such examining location, to apply for class C privileges, such holder of class C privileges shall appear within 4 months thereafter at an examining location and time designated by the Commission and be examined for class B privileges. If, under such circumstances, the licensee fails to appear for the class B examination, or fails to pass such examination, the class C operator license previously issued shall be subject to cancellation and, upon cancellation, a new license will not be issued for the class C privileges.

Sec. 12.46 Examination credit.—An applicant for class A privileges who holds an amateur operator license authorizing class B privileges will be required to pass only the examination element No. 4, advanced amateur telephony.

An applicant for class A privileges will be given credit for examination element 4 if within two years prior to the receipt of his application by the Commission he held class A privileges.

An applicant for any class of amateur privileges will be given credit for examination element one if within five years prior to the receipt of his application by the Commission he held a radiotelegraph first or second class operator license.

No examination credit for other classes of licenses or privileges shall be allowed.

A holder of an amateur operator license authorizing class C privileges will not thereby be accorded an abridged examination for either class B or class A privileges.

Sec. 12.47 Examination procedure.—When taking an examination for amateur operator license, or for additional amateur operating privileges, the applicant shall write in longhand, by means of pen and ink. Diagrams shall be drawn either with pen and ink or with pencil; likewise, code tests shall be written with either pen and ink or with pencil. Applicants unable to comply with these requirements, because of physical disability, may dictate their answers to examination questions, and if unable to draw required diagrams, may dictate a detailed description essentially equivalent. If the examination or any part thereof is dictated, the examiner shall certify the nature of the applicant's disability and the name and address of the person(s) taking and transcribing the applicant's dictation.

Sec. 12.48 Grading.—Code tests are graded as "passed" or "failed," separately for sending and receiving tests. Failure to pass the required code test for either sending or receiving will terminate the examination.

Seventy-four per cent is the passing grade for written examinations. For the purpose of grading, elements 2 and 3 (required for class B and class C privileges) are considered to be a single examination and element 4 (required, in addition to the other elements, for class A privileges) is considered to be a separate examination.

Sec. 12.49 Eligibility for reexamination.—An applicant who fails examination for amateur operator privileges may not take another examination for such privileges within 30 days, except that this limitation shall not apply to an examination for class B operating privileges following an examination for class C privileges.

AMATEUR RADIO STATIONS

Licenses

Sec. 12.61 Eligibility for amateur station license.—A license for an amateur station will be issued in response to proper application therefor to a licensed amateur operator who has made a satisfactory showing of control of the transmitting station for which license is desired and of control of the specific premises upon which all of the station apparatus is to be located, at a designated fixed location. An amateur station license may be issued to an individual, not a licensed amateur operator (other than an alien or a representative of an alien or of a foreign government), who is in charge of a proposed amateur station located in approved public quarters and established for training purposes in connection with the armed forces of the United States, but not operated by the United States Government.

Sec. 12.62 Eligibility of corporations or organizations to hold license.—An amateur station license will not be issued to a school, company, corporation, association, or other organization, nor for their use except that in the case of a bona fide amateur radio organization or society a station license may be issued to a licensed amateur operator as trustee for such society.

Sec. 12.63 Application for amateur station license.—(a) Each application for an amateur station license shall comply with the Commission's Rules and Regulations and shall be made in writing, subscribed and verified on Form 610 (application for amateur operator and/or station license). Form 602 should be used where the applicant is in charge of a proposed amateur station located in approved public quarters and established for training purposes in connection with the armed forces of the United States, but not operated by the United States Government.

(b) One application and all papers incorporated therein and made a part thereof shall be submitted for each amateur station license and shall be filed with the district field office of the Commission if personal appearance is required for operator examination in connection with the application for station license. If personal appearance is not required, the station application shall be sent to the Commission, Washington 25, D. C.

Sec. 12.64 Location of station.—Only one fixed location will be authorized and designated in the license for each amateur station. Unless remote control of the transmitter apparatus is authorized, such apparatus shall be operated by a duly licensed amateur operator present at the location of such apparatus.

The granting of authority to operate by remote control is contingent upon the filing of a proper application, supported by (1) a showing of the applicant's control of the control point, (2) a description of the means which will be employed to control emission, (3) a description of the equipment and method for monitoring the emissions and (4) a statement of the precautions which will be taken to prevent access by unauthorized persons to the premises on which the controlled transmitting apparatus is located.

Sec. 12.65 License period.—The license for an amateur station is valid normally for a period of 5 years from the date of issuance of a new, renewed, or modified license.

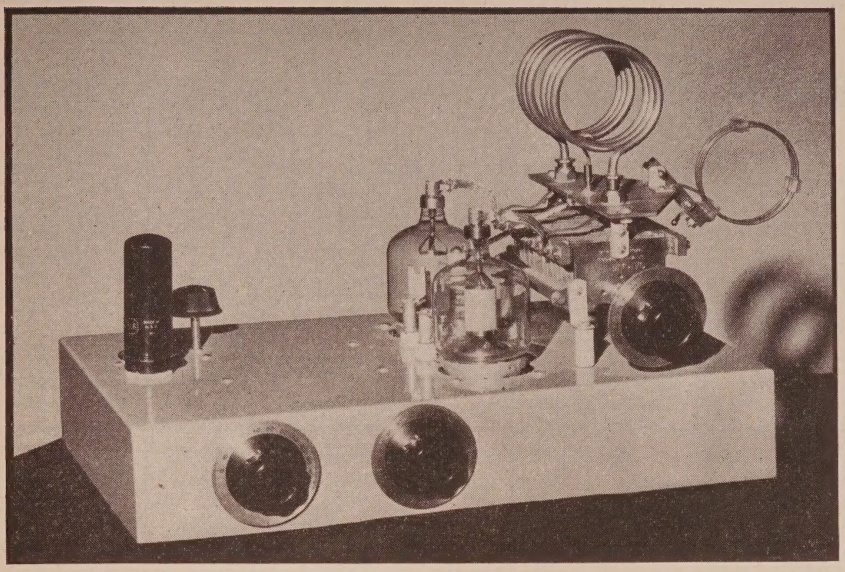
Sec. 12.66 Authorized apparatus.—An amateur station license authorized the use under control of the licensee of all transmitting apparatus at the fixed location specified in the station license which is operated on any frequency or frequencies allocated to the amateur service, and in addition authorized the use, under control of the licensee, of portable and mobile transmitting apparatus operated at other locations.

Sec. 12.67 Renewal of amateur station license.—An amateur station license may be renewed upon proper application filed not more than 120 days prior to date of expiration of such license and not later than date of expiration.

Sec. 12.68 Availability of station license.—The original license of each amateur station or a photo-copy thereof shall be posted in a conspicuous place in the room occupied by the licensed operator while the station is being operated at a fixed location or shall be kept in his personal possession. When the station is operated at other than a fixed location, the original station license or a photo-copy thereof shall be kept in the personal possession of the station licensee (or a licensed representative) who shall be present at the station while it is being operated as a portable or mobile station. The original station license shall be available for inspection by any authorized government official at all times while the station is being operated and at other times upon request made by an authorized representative of the Commission, except when such license has been filed with application for modification or renewal thereof, or has been mutilated, lost, or destroyed, and application has been made for a duplicate license in accordance with section 12.26.

Sec. 12.69 Revocation of station license.—Whenever the Commission shall institute a revocation proceeding against the holder of any radio station license under section 312 (a), it shall initiate said proceeding by serving upon said licensee an order of revocation effective not less than 15 days after written notice thereof is given the licensee. The order of revocation shall contain a statement of the grounds and reasons for such proposed revocation and a notice of the licensee's right to be heard by filing with the Commission a written request for hearing within 15 days after receipt of said order. Upon filing of such written request for hearing by said licensee the order of revocation shall stand suspended and the Commission will set a time and place for hearing and shall give the licensee and other interested parties notice thereof. If no request for hearing on any order of revocation is made by the licensee against whom such an order is directed within the time hereinabove set forth, the order of revocation shall become final and effective, without

[*Continued on page 56*]



Two stage, three tube kilowatt c.w. rig on one chassis is clean and efficient. Neutralizing plates are shown mounted between AT-340's. Tuning control next to 6L6 is the screen tuning knob

A Three Tube Kilowatt

A. H. NICHOLS, W9TQK

The new tetrode type tubes lend themselves to simple, compact rigs because the driver usually only requires receiving type components. This low-cost three tube kilowatt is typical of a new trend in amateur transmitter design.

USING A PAIR of the new Lewis AT-340 tetrodes this compact rig makes possible a very inexpensive and simple means of obtaining an input of 1 kw up to 30 mc. All components, with the exception of the final amplifier plate circuit and power supply may be of the receiver type as only 500 volts is used for the exciter. The outstanding feature of this type tube is its low driving power requirements which allows the use of a single receiving type tube as a crystal oscillator to excite a pair to a kilowatt input.

Circuit

Basically, the transmitter (*Fig. 1*) uses a 6L6 crystal oscillator-multiplier driving a pair of AT-340 tubes as push-pull amplifier. Most of the transmitter circuit is quite conventional with the exception of the oscillator screen circuit.

An experimental model was built using a 7-mc crystal in the oscillator-multiplier, exciting the PA to 1 kw input at 10 meters. An interesting innovation was worked out in order to increase the fourth harmonic output of the oscillator. This consists of placing a parallel tuned circuit in the screen circuit of the oscillator tube, tuned to the third harmonic of the crystal frequency. Thus, a voltage of 3f frequency is applied to the screen of the tube and the circuit effectively acts like the mixer in a super heterodyne. In other words, the combination of the crystal fundamental and the third harmonic in the screen circuit produces a greatly strengthened 4th harmonic in the output circuit. Measurements have shown that the 4th harmonic output is increased in the order of 75% by the addition of this circuit.

This circuit must be designed with high capacity and low inductance to prevent the tube oscillating due to the screen grid to plate gm. Taps should be provided on the coil to vary the third harmonic excitation. Provision should be

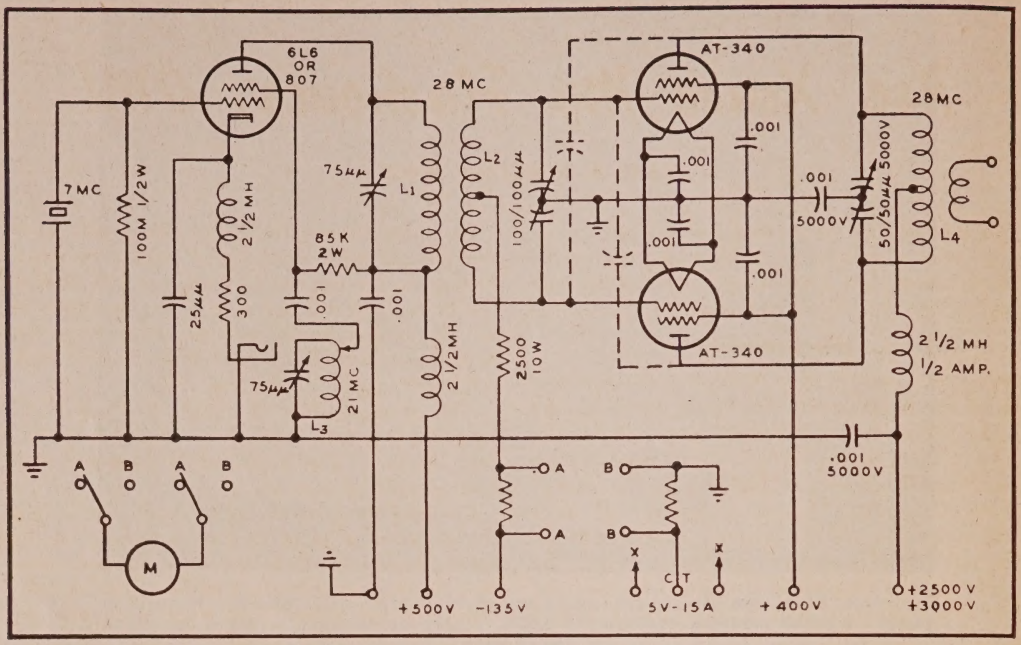


Fig. 1. Circuit diagram of three tube kilowatt transmitter

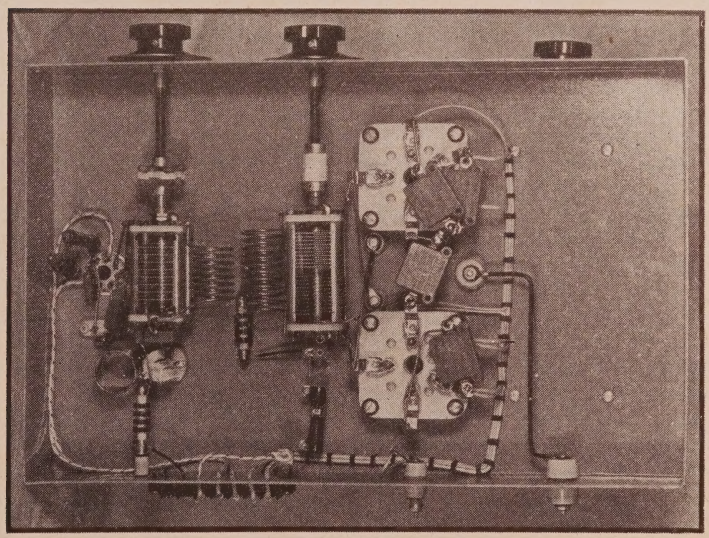
made for short-circuiting the screen tuning circuit for fundamental and second harmonic operation. Bending one rotor plate so that it shorts at full capacity accomplishes this very simply. The exciter unit then tunes as a normal regenerative oscillator.

Construction

The entire r.f. portion of the transmitter is assembled on a 17″ x 11″ x 3″ chassis. Considerable space could be saved, however, by using a smaller chassis and grouping the components more closely together. All components except the crystal, tubes and final plate circuit are mounted below the chassis. The arrangement of the top-chassis components is shown in the photograph.

In this view, the two controls coming through the chassis itself are, left to right, oscillator plate tuning capacitor and the amplifier grid tuning capacitor. The tuning control appearing above—chassis near the oscillator—multiplier tube is

[*Continued on page 50*]



Sub-chassis view of transmitter. The oscillator is inductively coupled to the grid of the final by the two parallel coil. Feed through bushings for optional neutralization are located between the PA tube sockets. Coil, with end up, is for tuning oscillator screen circuit to third harmonic of crystal

Pse Xcuse My Flashover, OM!

KARL A. KOPETZKY, W9QEA

"Oops, sorry OM, but the tank just flashed over . . . Some arc . . . ran my plate meter right over to the pin . . . Looks like it burnt out . . . Guess that will cost me five bucks for a new meter . . . " etc., etc.

THIS, OR WORDS to that effect, is quite common on the ham bands. One hears them equally on phone or c.w. While the ham will spend a load of time, barrels of sweat, and plenty of his hard-earned mazoola on building up that super-duper transmitter, he rarely figures out what will happen to the components when it goes on the air. He reasons that the circuit is OK, the tanks hit the frequencies he wants to use, and the tank condenser "looks" like it could "take a California Kilowatt."

His surprise on burning out meters and other components with continuous flashovers when turning on the rig, can be imagined. He blames the power line voltage surges, the moisture in the air. In fact, he blames everything except the real reason—he did not provide the correct tank condenser spacing in the first place.

The average Class B linear, or Class C r-f amplifier is usually hooked up similar to the circuits shown in *Fig. 1.* Either a push-pull or a single-ended job is built.

Consider the neutralizing condenser first. It is the source of a lot of trouble, especially on the lower frequency bands where the normal tubes used insure that the construction of the neutralizing capacitor is such that small spacing is the rule rather than the exception.

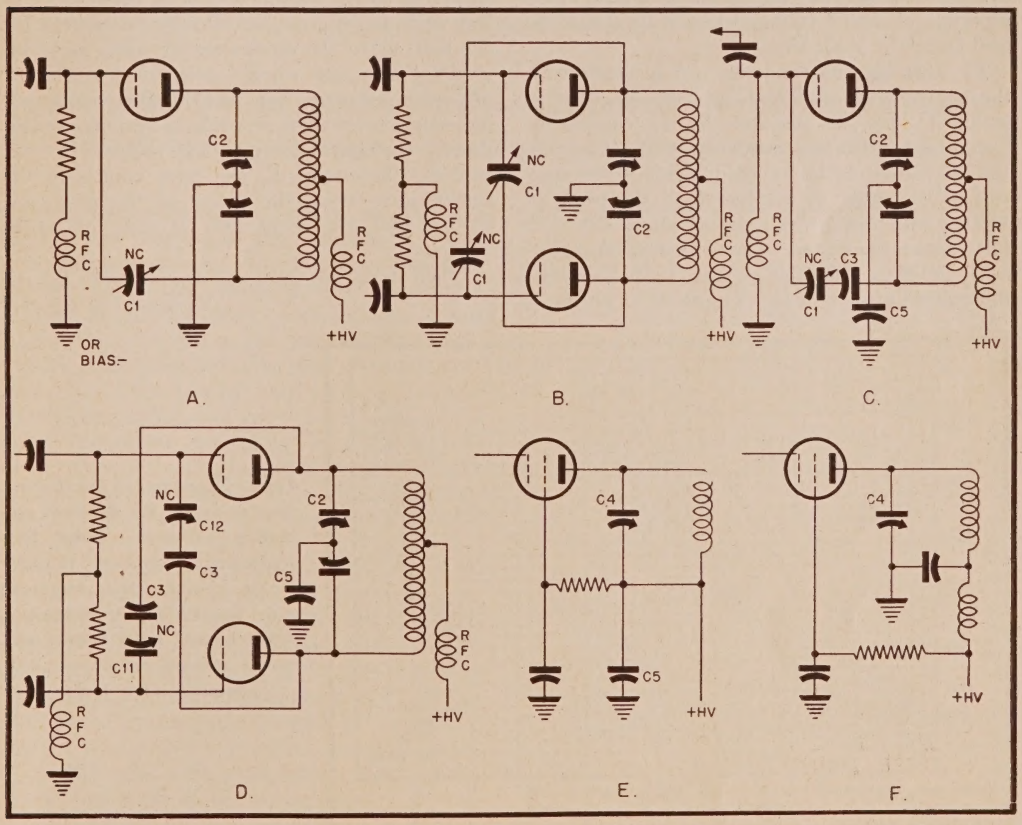


Fig. 1. Class B and Class C r-f amplifier circuits. Their susceptibility to flashover is discussed in the text

The simple, neutralized single-ended amplifier with a split-stator condenser *C2*, in the tank circuit is shown in circuit *A* of *Fig. 1*. The high voltage is connected between one end of the tank and ground. The grid of the tube is connected to ground through the bias supply, if there is one, or through a bias resistor and an r-f choke. The neutralizing condenser, *C1*, connecting the high voltage side of the tank to the grid, leads a bit of the r.f. from the tank to the grid 180° out of phase with the plate r.f.

It can readily be seen that condenser *C1* is directly across the power supply. In other words, one side of the condenser is connected directly to the plus high voltage, and the other to the negative with a resistance and an r-f choke in series with it.

Suppose the rig works with a plate voltage of 750 volts and is a phone job. The r-f voltage in the plate circuit will, on peaks and with 100% modulation, reach *four times the d-c voltage* of 750 or about 3000 volts. The neutralizing condenser *C1* is not across the tank circuit and hence it won't have to "take" the full 3000 volts. It will, however, have to take a part of the 750 volts (whatever is remaining after the voltage has been dropped through the bias resistor or supply) plus a portion of the r-f voltage which it furnishes the grid from the tank circuit.

By inserting the condenser *C3* in series with the neutralizing condenser, as has been done in circuit *C*, one can insulate the d-c component from the neutralizing condenser and leave only the r-f voltage to be handled. This might only run in the order of one-fourth of the peak r-f voltage plus the d-c voltage, or about 750 volts in the example stated. Condenser *C3* should itself be able to withstand at least twice the rated d-c voltage or 1500 volts. The effect of placing a fixed condenser of, say, .002 μf or even .004 μf in series with the neutralizing condenser is negligible, and is taken care of by the tuning feature of the neutralizing condenser.

A push-pull circuit, originally hooked up like that shown in circuit *B*, can be altered by addition of mica condensers *C3* to that shown in circuit *D*, with a resulting safety from flashover in the neutralizing circuits and no change in final operations.

Consider next the single-ended rig where no neutralizing is done. Such a circuit is shown in circuit *F*. Here the entire d-c voltage plus the r-f voltage is across condenser *C4*. Since, in a phone rig, this amounts to *four times the d-c voltage* at 100% modulation, the spacing of the condenser must be such as to take about 3000 volts, in the example stated. For c.w., it is best to figure twice the d-c plate voltage, for the r-f plus d-c voltage component. If the example rig were c.w., the voltage across *C4* for a plate supply of 750 volts would therefore be 1500 volts.

It is possible to insulate the rotor of the condenser of the single-ended rig so that the d-c component will not appear across it. This has been done in circuit *E*. Here capacitor *C5* effectively keeps the d.c. off tuning condenser *C4*. But while the spacing can thereby be reduced by one-half, or to the equivalent of what could be used for c.w., the wholly mechanical insulation problems in mounting the tuning condenser sometimes more than over-ride the expense of the greater spacing and larger size required in circuit *F*. In circuit *E*, the mica condenser *C5* should have twice the rating of the plate d-c voltage and can be of .002 μf mica or larger capacity.

When using the split stator condenser *C2*, as

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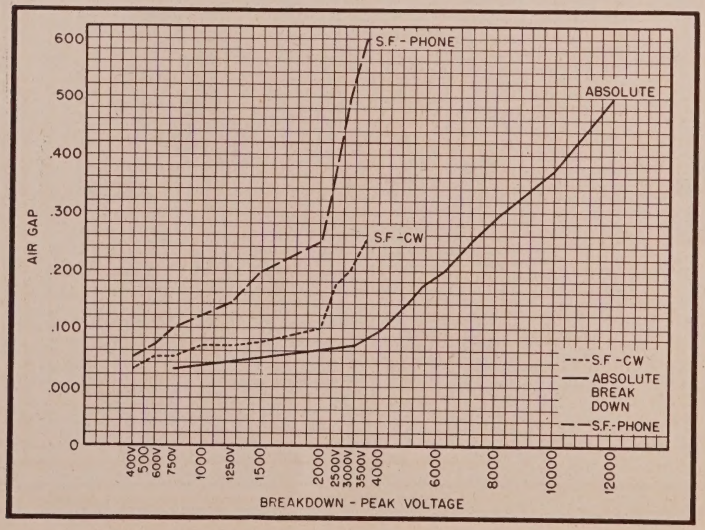
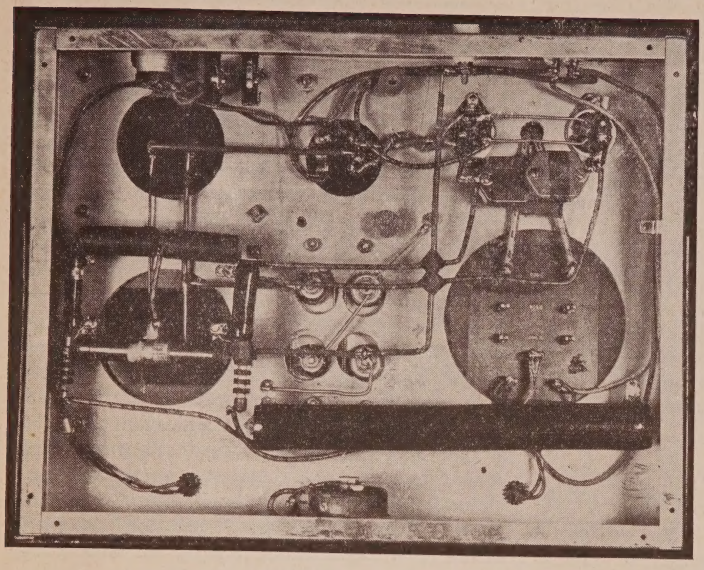


Fig. 2. Condenser air gap spacing recommended for different operating voltages. Solid line represents minimum requirements. Short dashes represent c.w. operation with adequate safety factor. Long dashes represent spacing for phone with adequate safety factor



The phase shifting network is clearly shown on the right hand side of chassis. Remainder of supply is similar to standard medium voltage unit

Variable Output

GRID CONTROLLED HV SUPPLY

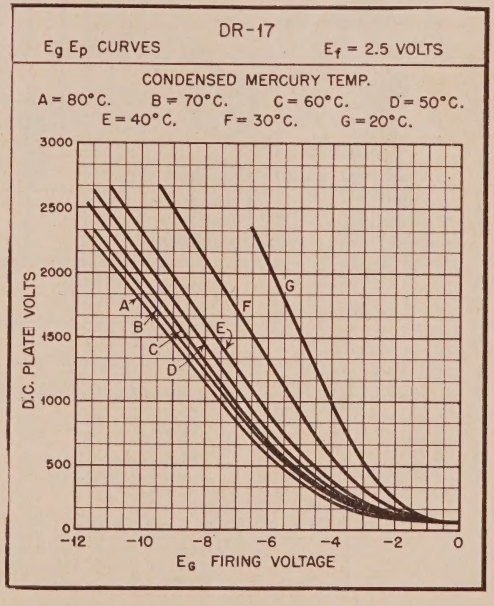
EDWARD J. OBERLE, W2LCA

Thyratron controlled rectifiers in a novel application provide a smoothly adjustable d-c voltage from zero to maximum supply output

WHILE GRID-CONTROLLED power supplies are not new they are still unusual in ham transmitter design. We had for some time planned a unit that would fit into the station as an all around universal power supply. It had to do a man-size job as the final amplifier plate supply, in addition to taking care of a variety of testing and experimental jobs, such as checking transmitting tubes, and supplying an easily controlled (manually) d-c voltage from 200 to 1500 volts. Financial considerations demanded economical design, although 15 or 20% above the cost of a fixed supply was considered bearable (roughly 10 or 20 dollars).

By making a few simple additions to the standard plate supply it can be converted to a grid-controlled rectifier unit which will supply a smoothly adjustable d-c voltage from zero to maximum. Although most of us have paid little attention to the FCC requirement of minimum interference for maximum transfer of intelligence, this power supply will provide a practical means of quickly and simply adjusting input power to the final stage of the transmitter.

There are several possible methods of controlling the output voltage and current of a power



Bias voltage requirements under varying conditions for DR-17 grid controlled rectifier

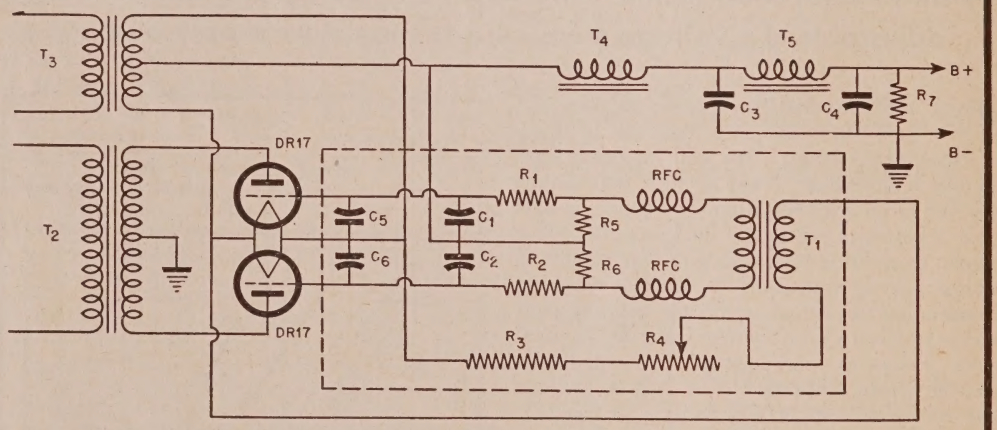
supply. The system discussed here has proven to be very satisfactory in actual practice. In the practical application of the system to any particular transmitter there may be minor variations in details but the basic circuit should be retained.

The unit described is used to supply plate voltage for a 10-meter transmitter, running about 350 watts input normally. A pair of General Electronics DR17 thyratrons are used in the conventional two-tube full-wave circuit, with the addition of a phase-shifting network. The filter circuit is the usual choke input combination. Diode characteristics of the DR17 are similar to the 866A. The phase-shifting network outlined in the diagram (*Fig. 1*) is composed of *R1*, 2, 3, 4, 5, *C1*, *C2*, and the thyratron transformer, *T2*.

Design Considerations

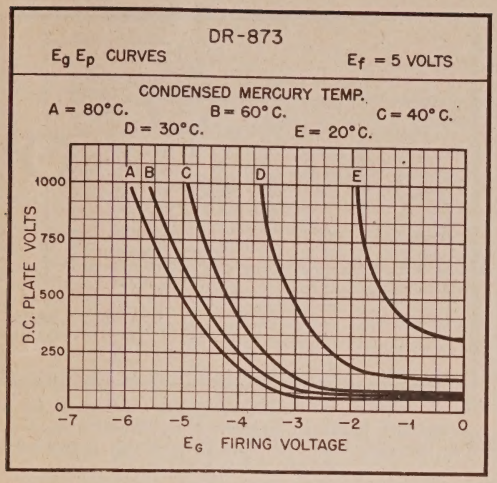
The thyratron transformer (T2) must have insulation that is capable of withstanding the peak a-c voltage of the supply, if the case is to be grounded. A considerable saving in cost is effected by leaving the transformer case float (insulated from chassis) and using a cheaper filament transformer, as a thyratron transformer. The primary (110 volt) winding is connected to the grids of the thyratrons through the 1000-ohm grid resistors (R1, R2) and the secondary winding (5 volt) is wired back to the rectifier filament secondary winding. Therefore we are using the 5-volt filament transformer (thyratron transformer) as a step-up transformer.

The impedance ratio of this transformer (primary to secondary) is not critical but should be kept near the recommended combination. Because of the high sensitivity of the control grid of these tubes, it is essential to shield the grid from the effects of external fields. Therefore, it is advisable to install grid-to-cathode bypass condensers (*C5* and *C6*) at the tube sockets. For a few applications it has been found satisfactory to eliminate these condensers. The phase shifting network controls grid excitation because ionization of the thyratrons is started by a positive plate potential and is stopped when the plate voltage is reduced below the ionization potential of 15 or 20 volts. In other words, the grid has no control over the plate current after the mercury vapor has ionized and it is necessary to reduce plate voltage below the ionization potential before it can again take control. In alternating current circuits this occurs every cycle and the grid may gain control during the half cycle when the anode is negative with respect to the grid, and conversely if the grid is made sufficiently negative we can stop the flow of plate current during subsequent cycles. By applying grid voltage early or late in the cycle (*Fig. 2*) high or low output



PART NO.	DESCRIPTION
C-1, C-2	.1 µf 600 V
C-3, C-4	8 µf 2000 V
C-5, C-6	.02 µf 5000 V
R-1, R-2	1000 Ω 10 W.
R-3	150 Ω 25 W. RHEOSTAT
R-4	50 Ω 25 W WITH SLIDER
R-5, R-6	5000 Ω 25 W.
RFC	2.5 MH
T-1	5 VOLT 2 AMP. FILAMENT TRANSFORMER USED AS THYRATRON TRANSFORMER
T-2	PLATE TRANSFORMER (1500 VOLTS, 250 MA)
T-3	RECTIFIER FILAMENT TRANSFORMER 2.5 VOLTS 10 AMP.
T-4	SWINGING CHOKE 5 TO 20 HENRY 250 MA
T-5	SMOOTHING CHOKE 12 HENRY 250 MA

Fig. 1. Circuit diagram, thyratron control power supply



Bias voltage requirements under varying conditions for DR-873 grid controlled rectifier. Temperature effect on firing voltage varies widely with different rectifiers

currents may be obtained. The value of grid resistance (*R1*, *R2*) should be as low as possible for the available grid driving power. *RC* should be less than .02 seconds in order to minimize loss of grid voltage and lower the magnitude of impressed grid signal caused by the effects of grid circuit components.

It is quite important that the voltage applied to the rectifier tube filaments by T3 be very close to 2.5 volts (±5%) because low filament voltage causes high internal tube voltage drop with subsequent bombardment of the filament and loss of emission. High filament voltage will shorten the life of the filament. When first placing these tubes in operation it usually takes from 15 to 30 minutes for the mercury to be distilled from the elements of the tube where it may have splashed during shipment and handling. Application of plate voltage during this period may cause arc-back and damage to the tube. Arc-back causes pieces of the filament to be knocked off, thus reducing the amount of emissive area. Once the tubes have been broken in, 30 to 60 seconds is sufficient heating time. As with all mercury vapor tubes, they should be isolated as much as possible from the transmitter because electromagnetic fields produce a breakdown in the mercury vapor, reducing life. In extreme cases a shield may be necessary around the tubes, although adequate ventilation must be provided.

Construction

By mounting the components of the phase-shifting network in a neat group in the front right-hand corner of the chassis, it is practical to build the unit so as to appear identical to a standard fixed supply from outward appearances. The 10″ x 17″ x 3″ steel chassis provides sufficient room and is bolted to a 1/8″ x 10½″ x 19″ steel panel. Lighter panels would require additional angle brackets to prevent sagging, if the unit is to be mounted in a relay rack.

The DR17 rectifier tubes are mounted in special high-voltage type Mykroy sockets because of the high voltage encountered, although any good ceramic socket would suffice. These rectifiers are mounted in the left rear of the chassis with plenty of room for free circulation of air. A neat job is obtained by cabling the power leads to the plate caps. The photos do not show it, but the thyratron transformer is mounted on stand-off insulators. An extra large hole is cut in the chassis to provide plenty of clearance for the high voltage leads from all the transformers. In the under-chassis wiring all leads at a high potential above ground are provided with heavy sleeve tubing insulation, and all small leads are tied to terminal strips.

The grid resistors are mounted near the tube sockets and should be kept clear of other wiring because of the high voltages encountered. Deviating from the listed values of capacitance or resistance in the phase-shifting network will cause the following conditions to occur: increasing the capacitance will reduce the minimum output voltage obtainable; a decrease in capacitance will

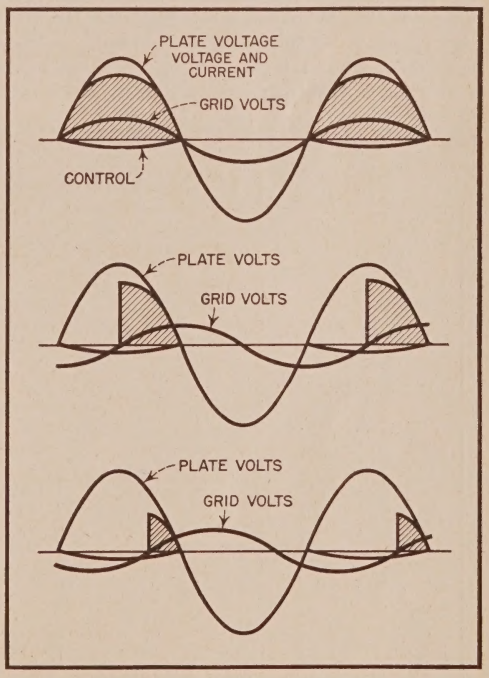


Fig. 2. By applying grid voltage early or late in the cycle, the output current is varied in the manner shown

raise the minimum point; increase or decrease of resistance will produce similar effects.

After the tubes have been broken in (sufficiently warmed up), plate voltage may be applied and the thyratron control grid resistor rotated from zero to maximum resistance. A voltmeter should be used to check the output of the supply and a gradual increase in voltage should be noted up to the maximum of the transformer in plate supply. The linearity of this voltage range can be made to taper considerably by the use of various tapered resistance types of potentiometers.

If the plate voltage output takes a radical dip or jump as the potentiometer is rotated, it is probable that there is a rough spot on the potentiometer winding or improper balance of the phasing network (wrong values of parts). The grid current should be 3 to 5 ma.

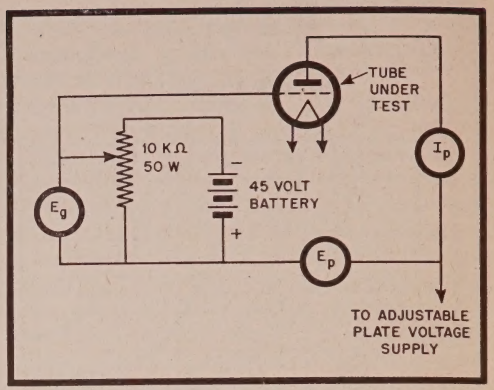


Fig. 3. Circuit for determining amplification factor of transmitting tubes to determine operating condition. With variable bias and plate voltage this is relatively simple test to perform

Applications

Probably the most important application for the grid-controlled power supply will be found in adjustment of the transmitter power input. For DX and similar work, the maximum power available is usually desired, but very often a contact is made with a local station where a smaller percentage of the available power will do a satisfactory job. For these contacts a slight adjustment on the control resistor will drop the plate voltage to a desired value, assuming c. w. is used. In the case of a phone transmitter the problem is not so simple because a change in E_pI_p conditions cause a mismatch in impedance to the modulation transformer[1], although there is a definite advantage in using this type of a supply for the following reasons:

(a). It is very much easier to adjust to the proper E_pI_p conditions for matching modulator impedance by setting the final amplifier tube's plate voltage to the exact required figure, rather than by trying to adjust taps on the modulation transformer while using a fixed plate voltage. In other words, a closer match can be made with less trouble.

(b). Knowing the required impedance for the modulation transformer to be properly matched, it is possible to have several predetermined conditions calculated, so that the voltage and current may be adjusted to any one of these by the thyratron control resistor. Since modulation impedance or load resistance presented to the modulator by the modulated r. f. amplifier is equal to:

TABLE 1—TEST CHARACTERISTICS—TRANSMITTING TUBES

Type	Fil. Volts	E_{c1} Volts	E_{b1} Volts	I_{p1} Ma	E_{c2} Volts	E_{b2} Volts	I_{p2} Ma	Mu
HY-615	6.3	vary	200	20	vary	250	20	18-22
HY-25	7.5	vary	375	25	vary	425	25	7-9
809	6.3	vary	800	20	vary	1000	20	50-60
TZ-40	7.5	vary	800	12.5	vary	1000	12.5	56-68
808	7.5	vary	1250	30	vary	1500	30	40-54
811	6.3	vary	1250	20	vary	1500	20	144-176
812	6.3	vary	1250	30	vary	1500	30	26-32
100-TH	5.0	vary	2000	40	vary	2500	40	34-42
203-A	10.0	vary	800	72	vary	1000	72	22-28
211	10.0	vary	800	72	vary	1000	72	11-13
HF-200	11.0	vary	1500	100	vary	2000	100	16-20
810	10.0	vary	1500	55	vary	2000	55	32-40
T- 200	10.0	vary	1500	100	vary	2000	100	16-20
HF-300	11.0	vary	1500	100	vary	2000	100	20-26
806	5.0	vary	2500	50	vary	3000	50	11-14
250TH	5.0	vary	2000	100	vary	2500	100	31-41
833-A	10.0	vary	2500	200	vary	3000	200	31-39
849	11.0	vary	2500	125	vary	3000	125	17-21
8005	10.0	vary	1250	50	vary	1500	50	18-22
8012	6.3	vary	650	40	vary	800	40	15-21

The manufacturer will supply characteristics on types not listed.

$$\frac{Eb}{Ip} \times 1000 = \text{Load Resistance}$$

Eb = dc plate voltage

Ip = dc plate current, ma, without modulation. Several values can be arrived at, for example:

Eb = 1500 volts / Ip = 250 ma	x	1000 = 6000 ohms	= 375 watts input
Eb = 1200 volts / Ip = 200 ma	x	1000 = 6000 ohms	= 224 watts input
Eb = 900 volts / Ip = 150 ma	x	1000 = 6000 ohms	= 135 watts input

Another useful application is found in making characteristic tests of transmitting tubes to match up modulator or amplifier tubes, testing for emission, mu, etc.

Table 1 gives the conditions for making these tests on some of the more popular transmitting tubes. In testing for mu (amplification factor) it is necessary to have an adjustable d-c grid bias connected to the grids of the tubes under test. Usually a 45 volt battery is sufficient for this purpose as the amount of current drawn is negligible (see *Fig. 3*). With the proper filament voltage applied, the tube under test is given the listed value of grid bias and plate voltage so as to provide the predetermined plate current. An incremental change in bias is now made and the plate voltage is changed to provide the same value of plate current. Mu may then be calculated by the equation:

$$\mu = \frac{\triangle Ep}{\triangle Eg} \qquad Ip \text{ constant}$$

for example:

$Ec1 = 12$ volts $Ep1 = 1000$ volts $Ip1 = 100$ ma
$Ec2 = 17$ volts $Ep2 = 1500$ volts $Ip2 = 100$ ma

$$\mu = \frac{500}{5} = 100$$

An emission test is one of the most common performed on vacuum tubes and, in general, if the emitter (filament) is emitting evenly an emission test provides an excellent indication of the tube's usefulness.

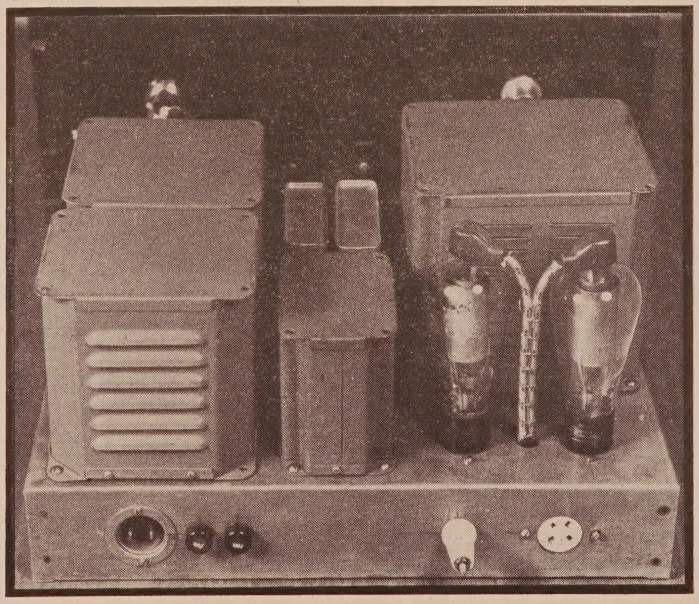
The principal disadvantages of the thyratron controlled power supply are:

1—Greater number of component parts to cause breakdown trouble.
2—Unsafe condition of floating the thyratron transformer.
3—Peak inverse voltage rating of thyratron lower than diode.
4—Poor output wave shape when less than 50% of supply voltage used.

It is our personal opinion, however, that the advantages far outweigh the disadvantages and it is only a matter of time until the popularity of the thyratron will become universal among hams. The writer wishes to acknowledge the help of W2MPS in construction work and tests.

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Thyratron power supply presents conventional appearance above chassis

Monthly DX Predictions --- JUNE

OLIVER PERRY FERRELL

Comments and Problems

Comments from the users of the Band Predictions are invited and are of interest to CQ and to the IRPL. If you have some transmission problem directly involving conditions for DX-ing or want to know what would be the best average hours for working a certain city from your location you are invited to write to the Propagation Editor, CQ Magazine, 342 Madison Ave., New York 17, N.Y. Please enclose either a penny postal or a stamped self-addressed envelope for reply. Allow 7 to 10 days for reply.

Many amateurs are aware that the Interservice Radio Propagation Laboratory (IRPL) of the National Bureau of Standards has been making basic radio propagation predictions three months in advance. To many amateurs these printed booklets, the IRPL-D series will be unobtainable and if one should fall into your hands, much of it will be just so much Greek. On the other hand, it would appear fitting that some use of these predictions be made strictly for the amateur. This can be accomplished, if they are translated into average conditions over certain predetermined paths. This month, to inaugurate a new monthly feature, *CQ* will predict amateur band DX conditions based on the IRPL announcements.

Values for radio transmission predictions are always interpreted as the "maximum usable frequency." This term denotes the highest frequency which may be transmitted over a finite path length by reflection from the F2 layer. Conditions visualized in the accompanying graphs are those of average days during the middle of June. Although radio conditions are fairly similar for equal latitudes, the longitude effect is very pronounced. Therefore, conditions over no two equal length paths in different directions are exactly alike. This month four paths are considered in bar graph forms.

In *Fig. 1* the predicted conditions are for the New York City-Cairo path. From midnight EST to 0700 hours the 20 meter band would be for all means and purposes on this path, "dead." Between 0400 to 0700, however, the shaded portion of the graph indicates that a boundary condition exists. In practice this boundary condition is the frequency difference between the maximum usable frequency and the optimum working frequency, thus during these three hours and on exceptionally good days it might well be possible to work over this path. From 0700 to 1300 hours the path is rather poor, but surprisingly enough from 1400 to 2000 the conditions on 20 meters are somewhat better. There is also some indication that the 13 meter band might be open, but 10 meter is very definitely "dead." Somewhat similar conditions exist on the New York City-Rio de Janeiro path, although 20 meters will be

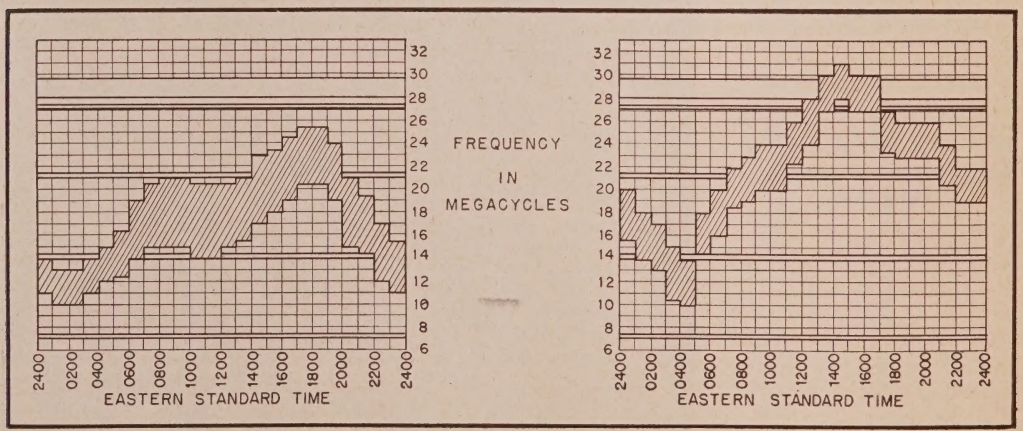


Fig. 1 (left), MUF New York City to Cairo, Egypt. June 1946 average. Fig. 2 (right), MUF New York City to Rio de Janeiro, Brazil. June 1946 average

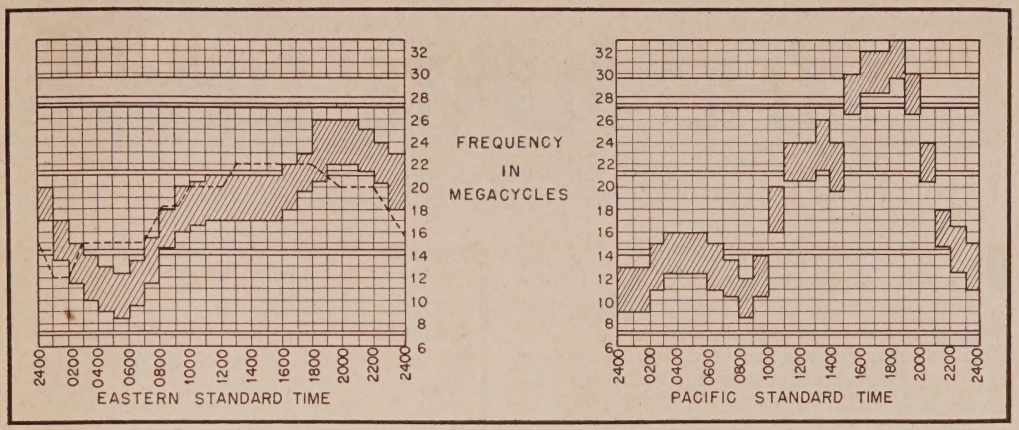


Fig. 3 (left), MUF New York City to Los Angeles. June 1946 average. Fig. 4 (right) MUF Los Angeles to Sydney, Australia. June 1946 average

open till after midnight and 13 meters from 1100 to 2000 hours. Ten meter boundary conditions will be present on most days from 1300 to 1600 hours.

From Los Angeles to New York City, 10 meters is out of the picture and 13 meters will be only fair between 1900 and 2100 hours. In this chart, as in all others, the factors of absorption and noise are neglected. This makes it appear as though 40 meters will be excellent on all paths at all times. Such, naturally is not the case, and the considerations involving noise and signal absorption will be discussed in subsequent issues. During the month of June, sporadic E reflection is also very prominent. Although, sporadic E sounds like something only of interest to the 6 meter DX'er, the IRPL has found that a certain percentage of sporadic E occurs constantly and many times becomes very important in working paths under 2500 miles. To include the factor of sporadic E, the heavy dashed line in *Fig. 3* represents the maximum average usable frequency predicted for June.

An interesting departure in the path from Los Angeles to Sydney, Australia in which we find 10 meters actually open from 1600 to 1800 hours on an average day is illustrated in *Fig. 4*. Boundary conditions of possible DX from 1500 to 1900 hours.

Generally speaking, June is a relatively poor month for DX. Noise conditions are very high and low frequency signal absorption is very strong (including 40 meters). A good chance to work south of the equator is present, with the middle ranges to Central America also favored. The middle west may work as far as Australia on 10 meters, but little DX of that type will reach the east coast. Trans-Pacific and Trans-Atlantic DX in the northern hemisphere is definitely out, but ionospheric storminess appears very low.

Who Started It ?

Did you ever have your car stolen—and recovered by the police much sooner than you expected, all because of the existence of municipal radio systems? If so, it has probably occurred to you that radio communications are invaluable to the efficient operation of police departments. However, very likely, it did not come to your mind that it was amateur radio which showed the public and their police departments just how useful this new "tool" could be in apprehending the criminals and the recovering of stolen property.

As far back as 1920, amateurs in New Hartford, Conn. started a new activity, namely, the organization of an amateur police radio system. Shortly thereafter, similar nets were organized in St. Louis, Dallas, and New York, also still later in other cities throughout the country. One of the major crime problems of those days was the recovery of stolen automobiles. The theft of automobiles was then becoming a serious problem. The police did what they could, but obviously were handicapped.

So the amateurs set to work on this new idea. Their plan was to broadcast descriptions of stolen vehicles, the descriptions being picked up by other amateurs in the net or directly by police officials in outlying towns. The idea worked very successfully, police departments were convinced beyond question of the extreme usefulness of radio communication in their work, and made arrangements for the establishment of their own systems. Incidentally, in many instances, individual amateurs either as new employees of the police departments or as "consultants," planned, installed and supervised the operation of these systems. —*Syracuse ERC Bulletin.*

THE PLATE DIP

ROBERT G. MIDDLETON, EX-6BTN, 6DEL

OBSERVING THE PLATE current dip to tune up amplifier stages is common practice. It is interesting to analyze the circuit and to see why the current behaves in this manner.

An amplifier stage is shown in *Fig. 1*, which we may regard as operating Class C. Thus, E_c is approximately twice cut-off and e_c is of sufficient magnitude to drive the grid positive at the peak of excitation. This leads to high efficiency.

It will be seen that current flow through the tube cannot be steady under these conditions, since the tube is cut off more than half the time. The plate current therefore flows in pulses.

Phase relations of e_c, e_L and i_p are shown in *Fig. 2*. This graph shows that although the plate current flows in pulses, that the flywheel effect of the tank circuit causes a sinusoidal voltage to be developed across LC. This adds and subtracts

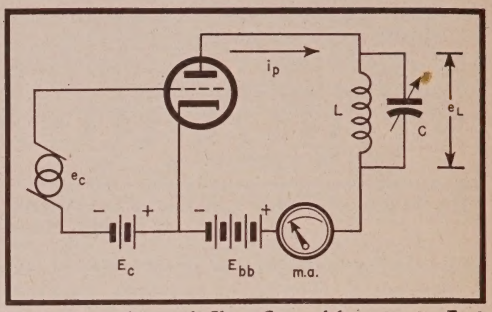


Fig. 1. Basic form of Class C amplifier circuit. E_c is chosen to place operating point of tube at approximately twice cutoff

alternately from E_{bb}, and current i_p flows when the instantaneous plate voltage is minimum.

Since tube loss is E^2/R_p, it is seen that less power must be dissipated by the tube under this condition, making the Class C stage high efficiency.

Now the pulse of current is a complex waveform, and is composed of a fundamental (frequency of e_c) plus harmonics whose amplitude in general is proportional to the order of the harmonic.

If LC is not resonant to either fundamental nor harmonic, L is practically a short circuit and current flows in pulses limited only by R_p. This means that the tube could easily be burnt up if LC is badly out of tune.

But at resonance, LC is a parallel resonant circuit, with an effective impedance $Z = L/RC$, where R is the inevitable resistance associated with L (and C).

Therefore, tuning the tank to resonance is equivalent, as far as i_p is concerned, to replacing a short circuit with a resistance of perhaps several thousand ohms. Of course less current can flow under these conditions, and the meter shows this fact by dipping.

If LC is tuned to a harmonic instead of the fundamental, a dip will again be encountered, since the tank is presenting resistance to the harmonic component of the current waveform.

In passing, it may be noted from *Fig. 2* that the smaller the angle of i_p flow, the greater the efficiency, since the instantaneous plate voltage is thereby minimized during current flow (period when tube dissipates energy).

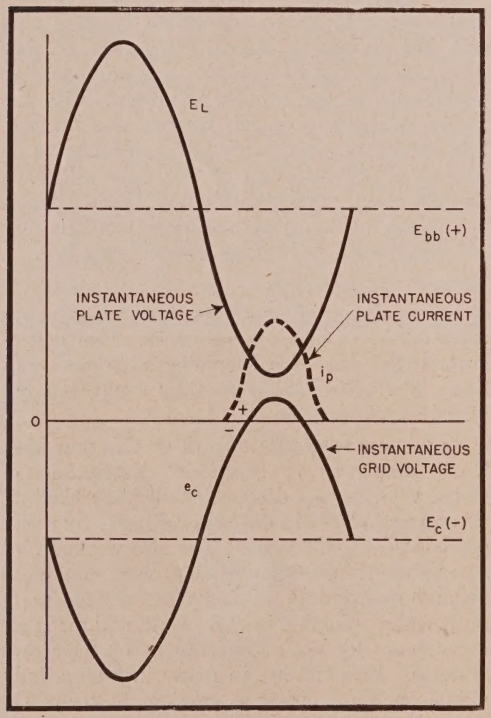


Fig. 2. Plate voltage-plate current-grid voltage relations of Class C amplifier. Plate current flows only while plate voltage is relatively low, causing minimum power loss in the tube.



CQ DX

By HERB BECKER, W6QD

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

Just about the time we thought we had a DX column pretty well underway, the 10 meter band did an "el foldo," leaving us high but not too dry for DX news. In the good old DX days before the war if one did fold, usually there was a little DX to report from another band. In this way the DX column usually had something in it resembling DX news.

Right now I think it might be in order to give a word about the use of VFO. Quite a number of the boys have voiced what might be termed their disapproval of the way various W stations would squish their VFOs on top of a DX station with the idea, of course, that this DX guy would listen on his own frequency first. So far so good, but what happens when this DX station can only work one man at a time? Do the rest of the boys move off a kc or so before they call someone else, or do they still squat right on this fellow's frequency? Most of you have a VFO of one kind or another, and you alone can answer this question. Maybe it would be a good policy if you find you don't raise a certain DX station to move off of his frequency, that is providing you're on top of him to begin with and you figure on calling some one else. In short, give the two fellows a break that are QSO and in this way you'll get a crack at him that much sooner.

There's a lot that can be said on DX operating technique, and everyone has his own idea on how to go after the stuff. Since we all more or less have to live with each other on the same bands, it's just as well to practice a little courtesy at the same time. Unfortunately, some of the boys who try to be fair regarding the above, as well as operating with a clean signal, sometimes come in for unjustified criticism. For example, suppose QD called a DX station (in this case not a W9) and didn't raise him! He probably would move off a couple of kc and unknowingly this *could* be right on top of another DX station and might come in for some heavy criticism from someone else. You can't please them all but it will help a great deal, I believe, if we can at least consider the stations we definitely know are working each other. Now that I have read Chapter 18 of Volume 7, we will proceed with what could be called some DX news.

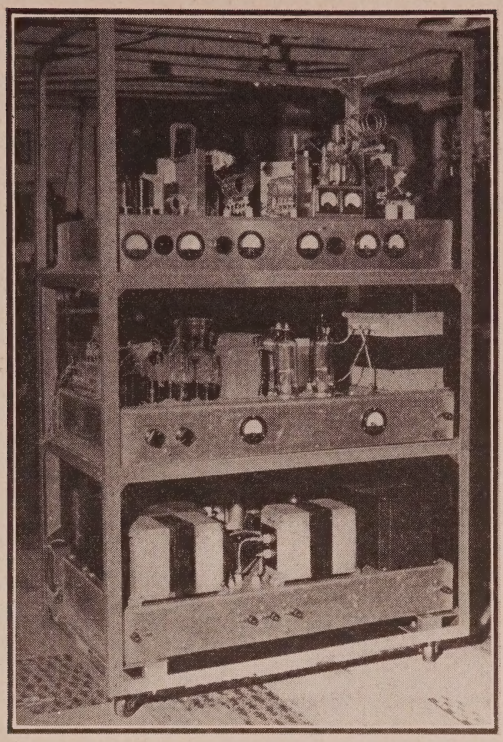
New England QRM

First off we hear from our old friend, W1HKK, Dana Atchley, who is a sales engineer with Sylvania. Last time we heard from Dana was in 1941 and he was an Ensign in the Navy. He came out of the Navy as a Lt. Commander but still W1HKK. Anyway, he has been on both 2½ and 10 meters. He has worked 37 countries and 20 zones on phone, as well as working WAC. Some of his better DX include EP1C, OQ5AE, VQ4ERR, VQ2PL, SU1MW, W7ELL on Iwo Jima, and W6QKB/KB6. His present station consists of the same 10-20 Mims Rotary Beam, a pair of 100THs in the final with 600 watts on them. As he says, he is no longer operating from Newburyport with all its acres, salt air, high poles, and rhombics. His station is now in Belmont, Massachusetts, on what he says is rather an over-populated hilltop with 5 local stations within sight of his mast. W3EHW worked W2LRI on Jarvis Island for his first East Coast contact, frequency 28040 kc. EHW also heard PK4DA on 28220. Ed has worked 40 countries and when last heard from he was chasing CN8AC, HH5E, CE2CE, XE1FE. Each of these would add a country.

Another old-timer heard from is W1APU, who is apparently in Dover Foxcroft, Maine. OM Bamford says that ham radio is going to be more



W3EOZ, Ardmore, Pa., smiling brightly after snagging country number 41 on phone. Final is T55 with 250 watts input to 3 element rotary



The new rig at W3EOZ ends up in a pair of 250TH's and is an all band kw, phone or c.w.

active in Maine than ever. They have about 40 or 50 members in the Twin City Radio Club, these twins consisting of Bangor and Brewer.

The following is some stuff W9EGQ collected and I am quoting it just as he wrote it.

Midwest Pickings

W9IU manages to work a few with his 833-A and a 3 element rotary. A few of the juicier ones for him are: XU1JV, W9JYF/J, W6MBA/KB6-Tinian, W9QMD/KE6-Johnston I., OQ5BQ, ZS6AM, LA4P, FA8B, YR5C, PJ3X, and W9IIL/K7-Aleutian Islands. If you like quantity, he can supply you there too. In a month he has worked 60 different G's, with 25 other Europeans sprinkled in the bunch. Counting the repeats, that gave him only a hundred European contacts; so Les consoled himself with 13 VK's. It adds up to WAC and 37 countries for W9IU. He puts it this way: "Herb, I haven't had so much fun in all my life. When Europe is in, I just call QRZ? and take my pick. As for counting countries, I'm starting over; it's more fun." I'm sorry I can't give you the frequencies of most of the above, but listen in the c.w. portion of the band—and don't be afraid to look below 28,000 kc., one or two DX stations have been worked out there in the past. W9AB dragged his 815 up from 144 mc "to work locals," but it took only a contact with ZS4H to make him forget the poor locals.

W9IIL/K7, 28080 c.w., 28350, phone, tells how it feels to be on the other end. "I am running 100 watts, and a four-wave Vee aimed at Chicago. I've worked 32 states, and all call areas, except W1. Haven't even heard one. K7 tacked on the end of your call makes a difference! Sometimes, it sounds like the whole band is calling me. I try to work as many as possible by keeping the contacts short, but I can only work one at a time! Best DX has been LU7."

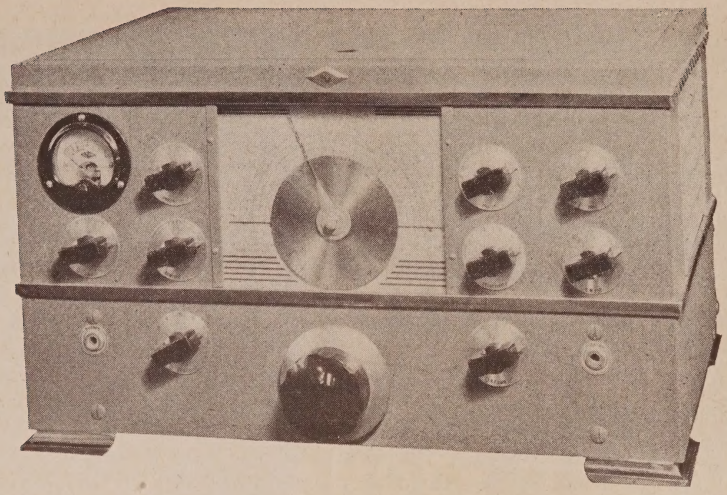
Val continues, "There are two other stations here on Shemya Island (Way out in the Aleutians, Herb.), W6QJW/K7 and W3EUC/K7. By the way, there are a lot of stations on in Asia that would be good DX for you fellows back there, W4YA, Burma, W2OAA/J8, Korea, VS6's, VS5, VS1, and lots and lots of Guam, Okinawa, China, P. I., etc." W9IIL/K7's address is: Lt. V. S. Buccicone, 713th Sig. AW Co., APO 729, c/o Postmaster, Seattle, Washington. Better send the QSLL card air mail if you are in a hurry for a reply. If you like, ship the card to me, and I'll see that Val gets it. Stick it in with your report on your DX, and 'Ill do the rest.

W9MVZ reports that one reason FA8NF puts through such a rocking signal on phone is that he uses a commercial rhombic and a half kw to an SCR-299. Frequency approximately 28,400. FA8JD pours in a wicked signal on phone too. XAFF, 28,650, and XAQI, 28,700, Naples, Italy are not to be passed up. CE2CE and ZS4AA help keep the phone men happy. The British Isles are a dime a dozen, but some of the better ones are G2NA, G5TN, G6KL, GI6TK, G6WY (Who doesn't remember him.), GW8UH and EI9N. They are all over the band; so pick your frequency.

W9DGA reports a few more on c.w., this time: PJ3X, YV5AP, W6MBA/KB6, TG9WPB, TG9-FG and the usual bunch of G's, XE's, etc.

W9PBS spends a good part of his time listening on 14 mc, and drooling. F8ZCA comes through down there with an S9 c.w. signal. A funny one was XB5AW heard calling CQ. He raised a CM, and came back signing XB5WA. Well, you've got to expect these little changes from time to time. YV5AE, among others, has been heard calling CQ-ten. Back on 28 mc, he logs EK1IND, Tangiers, ZS6DW, 28120 kc, W3FWI/CT2, W5GPA/PY7, W4HVT/PY7, W6NFH/-KB6, Guam and VP9R on phone and W9KXN/-CT2 on c.w.

W9HUV skeds W4EPT/K6, 28200 and 27,400, phone and c.w., and worked W6MBA/K6, Tinian, using an 807 doubler. Others he reports hearing are: K6CGK, W6TZB/K6, W3JJE, portable-mobile on a ship (which ocean?), T8 on



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28,150, LU7AZ, 28,190, LU9AX, OQ5AQ, T7, 28,090, XU1YV, T9, 28,000. W2KQT/KB6, 28,000, or ZS6AM, 28,150, TG9FG, T8, 28090, or W4YA on 28,000 in Burma may interest you. No? Then you are hard to please, but try these: F1DK, T9, 28,140, GM8MN, G6QS/I, G6WU, G2OA, K4KP, K4ESH, VO1S, HC1FG, HC-1CW, 28,090 kc, D4ARR, 28,070, YV4AP, T6, 28,150, KZ5AA, 28,050 and KZ5AC, 28,140. All the above are c.w. A few phones worth looking for are: HC1FG, VK2GU, 28,130, D4AIR, 28,170 and CE1CB, 28,085.

Bob thinks we should list two totals when bragging; the grand total and the number worked since reactivation. His is 85 and 7.

Eddie, W1IOZ has the same idea, but he is still cutting the cobwebs from around the 250TH's. He admits to working three stations with the portable-mobile rig. He doesn't list them; so probably they were not Asians! W9-EFQ/3 has a similar idea, and thought a resume of what was worked on the ham bands before the war would give the new fellows an idea of what could be worked on them. The above lists does even better by showing what they are working now. W9VW says little, but admits he bought an acre of ground—oh, yes, it has a house on it—and is working feverishly on a deluxe exciter for his 250TH's. His one hope is that 7 and 14 mc aren't opened until he is ready.

Of course you know that we are scheduled to get part of both bands by mid-summer, and the whole bands by the end of the year. Have you tried the new 11 meter band, 27,185 to 27,455 kc? As you know, any type of modulation goes there, and some of the boys are having a great time taking out all filters, using tone modulation, working phone duplex, and even working DX. W4EPT/K6, 27,400, and OA4R seem to have grabbed honors of being the first DX on the band. Those that have worked the band claim it opens an hour before the 28 mc band, and closes later. This is easily possible, because experience has proved that the low-frequency end of ten opens up as much as an hour before the high-frequency end. On the other hand, when conditions are really right, theory and practice show that the highest usable frequency for a given distance gives the best signal strength.

No doubt, there will be days when 28-29.7 mc will be dead while communication will be possible in the 27 mc band. It looks like it will be worth a fight with the diathermy machines for the frequencies.

VE Calls

Those odd VE calls you are hearing are a result of a slight change in the Canadian Call Areas. The new arrangement follows:

VE1—Maritime Provinces
VE2—Province of Quebec
VE3—Province of Ontario
VE4—Province of Manitoba
VE5—Province of Saskatchewan
VE6—Province of Alberta
VE7—Province of British Columbia
VE8A-L—Yukon Territories
VE8M-Z—Northwest Territories

The change should reduce the wear and tear on call books. It is no longer necessary to look up every new VE5 to check whether he is in the Yukon or NWT.

Heck, you're not interested in working Canada? Then look between 28,000 and 28,150 for HK1-AB, ZS5BZ, HB9CE, FA8B, LA2LA, OZ2BZ, W7DRF/I, OA4AB and ZS6EQ, all on c.w. If you have worked them all, how about VK6SA, VK5MP, VK3HG, VK2AHA, VK2NY or VK3HG? They are all on c.w., and should hold you until the *real* DX starts coming through. Personally, I am waiting to hear VP5PZ. When I do, I can start my hobby of calling him and K5AA (now KZ5AA). Other stations work them, but I called them both the first day I got on 14 mc and I continued to call them as long as it was legal to do so without a single QSO. XE1AM took himself off my list by answering my call on the last day it was legal to work DX before the war.

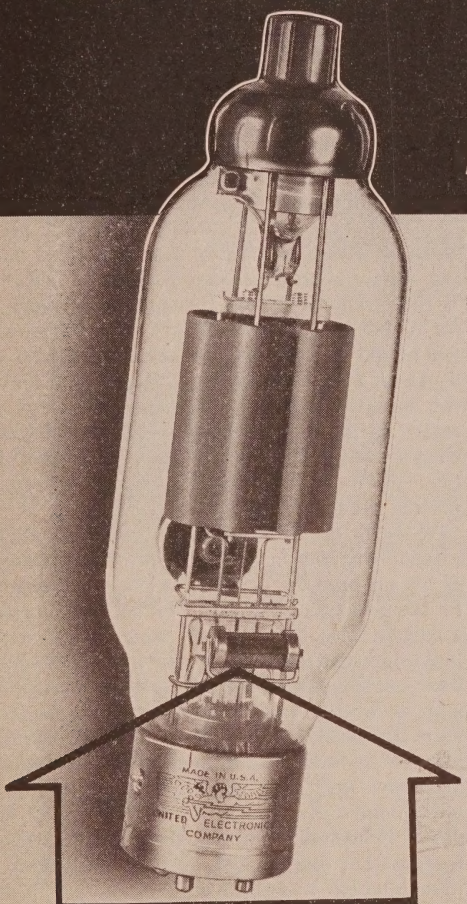
This old buzzard is surely glad to hear from W9FGZ/3, who is formerly W6HJP of San Francisco. He is Captain Arthur Monsees located at Langley Field, Virginia. Art is with the Development Branch of the ACS, and has been in the service for the past 5 or 6 years. He is on the air using a pair of 35Ts with 400 watts input, the receiver being an SX-28. At the present time he's operating c.w. on 10 and 80 meters.

Bumped into W6AM the other day and "squeezed" a little DX dope out of him. Says Don, K6MBA, formerly on Tinian, is now KA1AI, Clark Field in the Philippines. Don worked W3GZT operating on Okinawa, c.w., 28,050. W3GZT is using a pair of 807s but is going to increase his power to 200 watts very shortly. He says to QSL to his home address listed in the Call Book. Incidentally, 3GZT says that G5s and G7s come in very well on Okinawa. I forgot to mention KA1AI is using 3 stacked rhombics 80 feet high 5 waves per side and pointed for Seattle. Don worked the following one Saturday afternoon between 3 and 9 P.M., VK4UL, W3GZT/J5, ZL1GX, VK7CW, W6PUZ, Tinian, W8OK, Guam, SU8CM, Carlson Island, KA1QO and W7FOK.

W7VY worked WAC last month with G8, ZS, LU, VK, W4YA/XZ. Gene says he worked a good one in VS5JH located on Labuan Island,

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Borneo. The guy was running 25 watts, 28,212 kc. He'll be there until August, VS5JH that is.

I have been trying to get W2IOP, the managing editor of this mag, to get off the dime and work a little DX himself. This is Larry's latest report—"have worked really nothing much." He's a big help.

A note from W2KIK/5 at Camp Polk, Louisiana, indicates he has been working a little DX on phone, such as D4AAG, 28,350, W8FYF/VO, 28,500, W8WSY/ZC3, 28,150, W8QEN/CT2, 28,900, W9NWM/J9 (Majuro) 28,050. W2KIK uses an 813 in the final driven by an 807. The Modulator uses a pair of 24Gs in Class B.

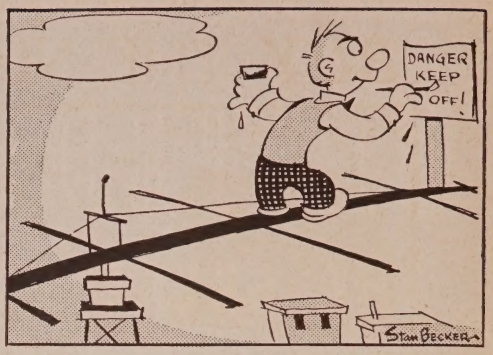
W9LTR has changed his final to a pair of T55s running 450 watts input. His 10 meter antenna is bi-directional East and West and calls it a cubical quad. Since November 15 he has worked 20 countries on 28 mc phone. He says his DX has fallen off badly since February 17 because on that date he acquired a XYL and, of course, you know that *that* means.

W9IVZ is running 70 watts into an 807 and modestly says his DX record worked is not too impressive, but his list of stations heard is much better. He says he's not in favor of running his 807 as a doubler to 10 meters because of what happens on 20 meters. So he has lashed up a pair of 809s which follow his 807. He believes there will be fewer citations and more efficiency. I believe he is about right, too.

A letter from W9DXX, Alice Bourke, addressed to W9EGQ has been forwarded to me and it is certainly nice hearing from 9DXX again. Due to a little throat trouble she has had to forsake operating on phone, and from now on, for a while, she will be on c.w. exclusively. Although she lives in Homewood, Illinois, she is in Chicago most of the week and has a station located in one of the office buildings with the antenna on the roof 46 floors high.

W9DGA tosses in an oddity when he says his first VK was VK3XK and the second VK3KX. Among other stations he has worked on 10 meter c.w. are TG9FG, W7DRF in Italy, G6ZO, Italy, FM8AC, YV5AP, etc.

From Art Milne's (G2MI) column we see the boys in England are limited to 10 watts on the top of the band. (Presumably the 1.8-2.0 band). They do not like the fact that the American GI's in Germany are using as much as 500 watts on this band, as the Gs are limited to their low power in order not to cause interference with other services. Also in Art's column we hear from our old friend Eric Trebilcock now located in Tasmania. Eric remarks on how quickly the GI's seem to get ½ kw Army rigs perking on the ham bands. We also learn that G6ZO in Italy has been on 1995 kc and worked G4FB and 6BQ. G8IG made WAC and WBE in 4¼ hours on



March 11 using 70 watts. Contacts were W5/KDA, Okinawa, VK4LP, XABY, SU1USA, W3BDL, HK4AX, and VE4EK.

W4FIJ of Atlanta dropped a line to 9EGQ and Herb passes it along to me. So far W4FIJ has worked 44 countries, the majority of them on c.w. Norm says that W4FBH has a new 4 element rotary and is working some good phone DX. Others in his neck of the woods also working their share include W4DOC, W4GXU, W4BBP, and W4EJN. Incidentally, Norm's rig for 10 meters uses a pair of 35Ts in the final with 200 to 300 watts input. His modulator tubes are a pair of 6L6s, and he says "those little bottles can surely take it." His antenna is a 4 element rotary using a quarter-wave section of 52 ohm coax to match the driven element to a 300 ohm line. His receiver is an SX25 "perked up" by replacing the 6SK7s with 6AC7s.

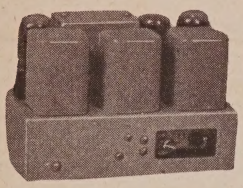
W3EOZ of Ardmore, Pennsylvania, at the present time is using one of his former exciter units of his pre-war kw transmitters as a transmitter for the present. The final of this rig winds up with a pair of T55s, running 250 watts input. He is building a new rig using a pair of 250THs in the final. 3EOZ has worked 41 countries on phone and, as he modestly states, he is sorry it isn't more but inasmuch as his duties with RCA require him to be away from home for long periods he cannot very well help it. His receiver is an AR-88 and, incidentally, he said the total cost of his 3 element beam with the supporting structure was not over $15.00. All in all it looks as though he has a swell layout.

Activity out on the West Coast is no more than elsewhere which as you know means DX is at a low ebb. VKs and ZLs, as well as some of the Pacific stations, are coming through but even these are quite spotty. It was swell working VK3MR, VK3KX, and ZL1BY again. In the first place early in the war I noticed in the RSGB bulletin where VK3MR was in an Italian prison camp, and naturally it seemed like old times to work this dyed in the wool DX-er. VK3KX, Ron Tandy, needs no introduction to the old-

[*Continued on page 51*]

BUY THE NIAGARA WAY!

SPEECH AMPLIFIER

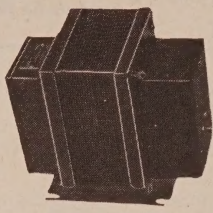


This is a complete speech amplifier minus tubes and power supply working from dynamic or carbon microphone to Class B grids. Noise level less than −55 db. Designed for use in Collins ART/13 Auto-tune transmitter

Uses 2 6V6G's and one 12SJ7

$7.95

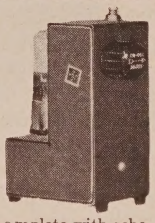
SWINGING CHOKE



Swings from 60 to 9 Henries. 50 to 400 mils. Built by Langevin. A marvelous choke for class B modulators —while they last

$12.75

BEAT FREQUENCY OSCILLATOR

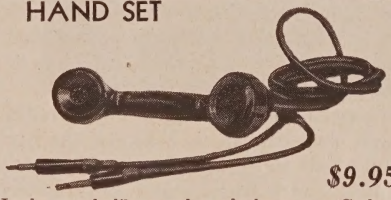


Can be used as C.W. OSC. Basic OSC for frequency meter. Signal generator. Original frequency 372.6 to 415.7. With one Padder removed, becomes 456 or 465 KC.

$3.95

Comes complete with schematic hardware and 6J5 tube.

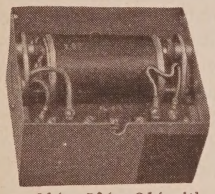
HAND SET



$9.95

Looks exactly like popular telephone set. Carbon mike, 200 ohms, magnetic phone with new Alnico No. 5 magnet—2000 ohms. Complete with rubber cord (6 ft.) standard mike and phone plugs.

DYNAMOTOR



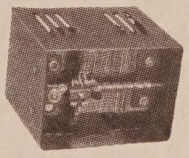
12 volts DC input—delivers 235 volts at 90 mils. Complete with filter—mounted in can.

$2.95

6¼ x 5¾ x 3½ with cover.

AMERTRAN TRANSTAT

Designed for adjusting filament voltages. 20 amp. up to 50 volts AC. Adjustment may be locked after setting, Terminates in an aircraft Amphenol plug mounted in a black crackle case with air louvres.



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ADDITIONAL ITEMS

Class B Modulation transformer used with the Collins auto-tuned transmitter. Modulates an 813 tube both plate and screen from 811 modulators. Good for as much as 150 watts of audio at **$4.95**

Western Electric class B driver transformer will match 6L6 tubes push-pull to grids of any class B tubes. Limited quantity. **$3.95**

General Electric 10 Henry, 250 mils, smoothing choke. These chokes made to very rigid Gov't. specifications. **$3.50**

Class B 599 watt Transformer made by N.Y. Transformer Co. Ratio 1.58:1 primary 7200 ohms, secondary 2650 ohms. For you KW boys Come and get them for **$23.75**

Signal Generator. Navy type OAN covers from 200 kc to 2 mc, M.O.P.A. Will operate on batteries or 110 volts, 60 cycles. Comes complete with 15 feet Ant. RF can be taken from Probe or sectional ant. Special **$42.50**

Cramer running time meter, 110 Volts 60 cycles—reads to 9999.9 hrs. **$4.95**

Choke—150 MA—10 Henry—20 Ohms **$1.49**

807 Tubes, JAN. **$1.49** 813 Tubes, JAN. **$9.95**

Hewlett-Packard Audio Oscillator No. 200B. Frequency range 20 cycles to 20,000 cycles in 3 ranges. Complete with tubes and power supply. Used but reconditioned and guaranteed **$75.00**

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The YL's Frequency . . .

by Amelia Black, W1NVP

Since this column last appeared yours truly and the OM have migrated to New York City, where we hope to be back on the air soon with our old calls—W2OLB and W2ESO.

In the meantime we've done our hamming vicariously, attending both the Queens Village hamfest and the New England Division convention—the latter being especially worthwhile in view of three prizes won by the family, one of which was a pair of nylons!

For the first time since getting into ham radio we have been close enough to a YLRL chapter for me to take part in these local activities, and I find the girls a very friendly and enthusiastic group. Any of you W2YLs who are interested in joining the New York City club may attend one of the regular meetings at the AWVS Building, 17 East 67th St., the third Friday of every month at 8:15 p.m., or you may contact Lillian Ruocco (the secretary) at 1630 Undercliff Avenue, N.Y. 53, N.Y. Lillian, by the way, is one of those girls who entered ham radio through AWVS, and received her class B ticket in 1942.

You may join the national YLRL by writing to the secretary, Louise Baker, W9JTX, of 635 North 53rd Street, East St. Louis, Illinois. We know from personal experience that you will find Lou very cooperative.

Incidentally, Lou has just gotten one of the new five year tickets, and W9JTX is again active on 80 c.w.

YL DX

Ever since listening to Ada Leonard at W6MBD working EA1D, when 10 opened last fall, we've had a notion that a special YL DX corner would be pretty appropriate. After all, most of us have to compete not only with QRM but also with the OM when it comes to DX; the big lug puts up the antenna, so he usually claims he has the right to use the rig when the band is open.

Be that as it may, here's one report to start the ball rolling. Lenore, W2NAZ, added country number three on 80, when she snagged VO1P (Newfoundland) the other night.

In past years, while working 80, 40, and 20, we got pretty used to the comment, "You're the first YL qso'd here," but it looks like the competition is going to be a bit tougher from now on. In New York City alone there are over 50 licensed YLs, who are waiting for calls. A few new ones are W2OWL and W2OVV, with W3KGC and W7FJB representing other brand new YL calls.

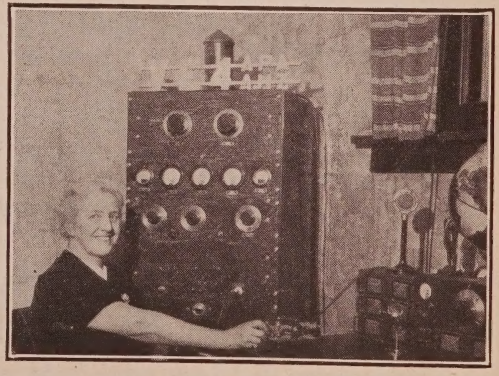
W2NAZ, by the way, has made her debut on 75 phone, having just received her class A ticket. She also reports being quite surprised recently, when working W2JRE, who had a 10-meter mobile rig in his car, to find that a large crowd was gathered beneath her apartment window. It was possibly because she was leaning out of the window talking into the mike, as he moved the car down the street. The sad part is now the neighbors have Lenore and Joe spotted; a flood of BCI complaints is expected as soon as summer static sets in on the BC band.

Maude Phillips, VE6MP

Our YL of This Month is such a lively and humorous person that it would be exceedingly unfair to write a dull or unfeeling story about her.

Perhaps the best thing about Maude is her keen sense of humor, which she is constantly turning on herself. She tells of hearing another Alberta ham calling her "Windy" on the air one day (she's an indefatigable rag-chewer), and instead of being hurt, she thought it was very funny. And much to his discomfort she took it up, telling the story all over the air, and referring to her new name as "Windy Phillips." She also insists that she has the bulge on those YLs, who still have good pre-war girdles.

Maude lives in Chancellor, Alberta, a town of but 35 people ("hamlet" on the tax notices) where she is the general storekeeper. Her store



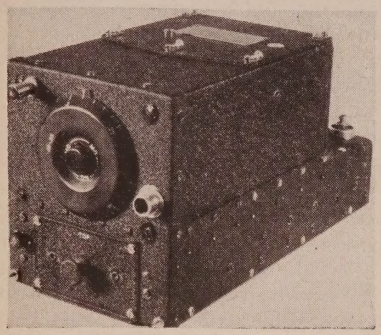
Maude Phillips, VE6MP

HERE IS THE ARC/5!*

NAVY EQUIVALENT of the SCR 274 N

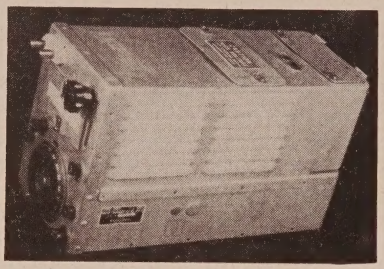
(SEE PAGE 18 MAY CQ)

*NEW



RECEIVERS

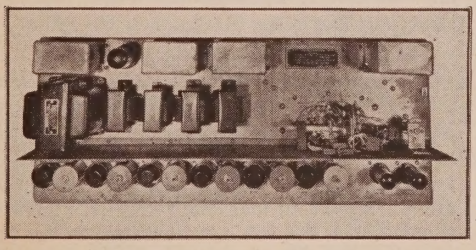
NEW RECEIVERS ARC-5; Superhet **$79.50**
TUBES: (included) 3-12SK7; 1-12K8; 1-12SR7; 1-12A6
RANGE: (when ordering, specify frequency desired)
190-550 KC
520-1500 KC
3-6 MC
6-9.1 MC
POWER: 24-28 volts DC
REMOTE CONTROL BOX and DYNAMOTOR



TRANSMITTERS $109.00

NEW TRANSMITTERS ARC-5
25 watts CW; 15 watts phone
TUBES: (included) 2-1625; 1-1629; 1-1626; 1 crystal
RANGE: (When ordering, specify frequency desired)
.5-.8 MC
.8-1.3 MC
1.3-2.1 MC
3-4 MC
4-5.3 MC
5.3-7 MC
7-9.1 MC
POWER: 24-28 volts DC Input
MODULATOR UNIT: (with tubes) 1-1625; 1-VR150; 1-12J5
REMOTE CONTROL with key; less dynamotor

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In lots of 25.....$3.50
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is the only one for ten miles, and customers come from a radius of ten or fifteen miles to do their trading and to exchange gossip around Maude's stove. She says advice is exchanged on every subject from raising babies to growing and selling wheat. Even advice to the lovelorn is meted out here! Despite the difficulties of being a storekeeper during times of shortages (handing out jelly or sugar wrapped up to look like turnips) Maude loves it and finds her days stimulating and amusing. The people for miles around, even the smallest children, call her "Maude", and when she is busy, wait on themselves, and even make their own change in her till!

Originally licensed VE4APA, "A Perfect Angel" to her friends and "A Punk Amateur" to the OM, so she says—Maude's new call is VE6MP. She has been an amateur since 1938, and licensed through the efforts of the OM, Glen, VE6HZ (then VE4AHZ). She says that the darn "Set" was such a nuisance when mealtime came or when she needed a few little things done around the house, such as lighting fires or taking out ashes, that she decided the only solution was to get into the game herself.

She got her 13 words in less than six weeks "for a purpose and one purpose alone—to get that LICENSE!" She describes the day the radio inspector gave her the test, "Gosh, I'll never forget how nervous I was, but I was really lucky. He came out here to examine Glen's transmitter to put him on the Class A bands, and while here Glen said that I should come up to the house and try my luck. I hadn't practiced for weeks at the code and felt doubtful, so before I left the store, I got a nail out of the old nail keg and tapped out everything I could see on my shelves—on the glass of my scale here. I even tapped out a notice of the 'Broncho Buster' Stampede and Ball to be given in the next town. It was hanging on the wall in big letters! I got through with flying colors, and even had more speed than was necessary, but I don't think Bill (the R.I.) liked it any too well when I told him had I known it, I would have stopped sooner, as I had just used the code as a means to an end!"

After receiving her license Maude was on almost daily on 20 and 10 (and is now back on 75 and 10 phone). She admits that after she got her ticket the OM had a difficult time getting at the mike, and laughs at his chief occupation, which was sitting over on the studio couch in the radio room and yelling out "bologny" if she got beyond control. The only way Glen can get the mike is if some ham wants to talk "technics," and then she willingly turns it over to him, that is, if she can't talk her contact out of the said "technics."

She has had many humorous contacts on 10 and 20. One she describes was with Joe and Adolph, at W2KHR whom she often worked on 10. "I remember one day Adolph opened his window and let me hear the street noises of old New York . . . a wonderful thing. Here was I, sitting out here on the bald headed prairie, about 3000 miles away, and hearing the Third Avenue El ramble by. It was usually about five p.m. New York time, and apparently it was just about the time that Joe was eating his evening meal, for a couple of times I heard Joe yell out to his pal, 'Hey, shut that window. You're cooling my spaghetti!' "

Maude says that the short time that she was on the air was the happiest of her whole life, and that she never had anything that filled her life so completely in the way of a hobby.

Her other hobbies are an outgrowth of her ham activities. She is an ardent stamp collector, and has received many of her best stamps from hams and SWLS with whom she is corresponding. One of these SWL's, whom Glen calls "her sugar daddies," has sent her over $20 worth of First Day covers.

Another hobby is her letter-writing, which has grown to enormous proportions during the past few years. Her ham correspondents alone number over 70, and live all over the world. She also collects photographs of her ham friends, and has large scrapbooks full of their pictures. The Phillips have been visited by their ham friends from as far away as North Carolina.

Maude's amateur activities have included being instrumental in making a match between an Alaskan ham and an American YL. During the winter when he couldn't get any mail in or out—she would write his love letters per his instructions and relay the answers via radio.

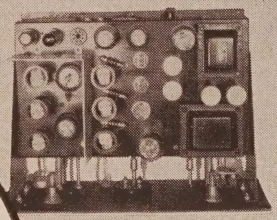
The country Maude lives in is entirely a wheat ranching country, and Glen is a wheat raiser. During periods when he's been short of help Maude likes nothing better than donning an old pair of slacks and going out and helping with the harvest. She drives the truck of wheat into the grain elevators to market, or drives the tractor, when that is needed. At these times the postmistress next door looks after the store for her, while still minding the post office! Then later Maude may be postmistress, when the PM is called away to help on her husband's farm.

Maude is a perfect proof that you can be happy and active wherever you live—it's up to you. She sums up her philosophy by saying, "Happiness has to start by itself. We can't grasp at it and hope to catch it. But when we let things that cause happiness take charge of us, things like kindness, generosity, patience, friendliness—well, happiness is right there, too. It comes by drilling ourselves to expect good things to happen to us."

New! Exclusive! Ready Now!







WRL
Globe Trotter
25 WATT OUTPUT
TRANSMITTER KIT

The Sensation of the Year!

Transmitter kits are almost impossible to get, but Leo, W9GFQ, now offers amateurs the new WRL Globe-Trotter, destined to become one of the most popular kits on the market. The WRL Globe-Trotter is capable of 25 Watts output on all bands from 3500 KC through 28 Megacycles. Incorporates the proven Tritet Oscillator using a 40 metal X—Tal and providing sufficient drive at 10 meters for the 807 final. Heising choke modulation is incorporated and is capable of 100% modulation with good tonal quality. Look this over! It has everything! Three bands are all pretuned and available at the turn of a switch, 10, 20, and 80 meters. Metering is provided for both oscillator and final stages. The transmitter uses two power supplies, one furnishing power to the 807 final and modulator tubes, and the other supplying the speech, amplifier and oscillator stage. Tube Line Up: RF—6L6 OSC, 807 final amplifier; Audio—6SJ7, 6N7, 2-6V6S—Rectifiers, 2-5U4G.

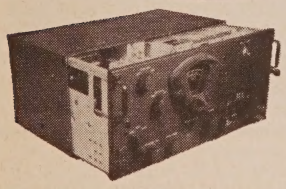
Complete kit including all parts, chassis, panel, streamlined cabinet less tubes, coils and meters. **$59.95**

Cat. No. 70-300

Kit Same as above. Wired by our engineers
Cat. No. 70-312.....$75.00

ACCESSORIES

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3 in. Meter Cat. No. 70-318	4.95
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Counterpart of the famous SCR-299. 825 watts input on CW, 540 watts input on phone; 3 sets of coils. Range of 1½ to 18 Meg. Completely reconditioned, Cat. No. R70-202, $510.00—New Cat. No. 70-202, $760.00. Reconditioned or new sets converted to 10 meters, $25 extra.

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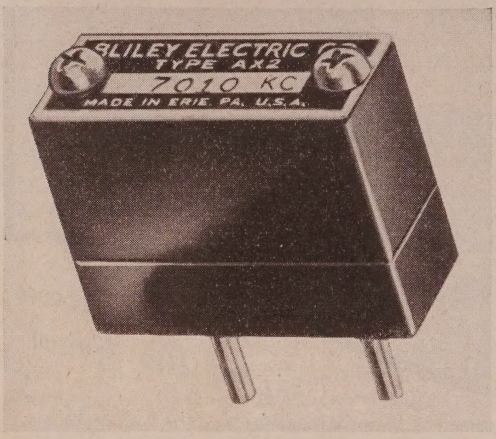


parts & products



Plated Crystal

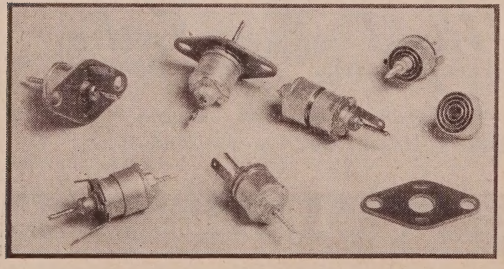
A new plated crystal for amateur frequencies has been announced by the Bliley Electric Company, Erie, Pennsylvania. This new crystal, Type AX2, features primary electrodes consisting of a micro-thin metal film deposited directly on the major



crystal surfaces by evaporation under high vacuum. Secondary electrodes, under spring pressure, clamp the crystal and provide necessary thermal dissipation. This design results in better grid current stability over a wide temperature range; improved frequency stability under high drive conditions; and substantial improvement in keying characteristics. Complete technical and mechanical data available from manufacturer—Bulletin 30—on request.

Ultra-Compact High-Q Air Trimmer Capacitor

A new and novel air-dielectric capacitor of unusually high Q, extraordinary stability both mechanical and electrical, easy of adjustment, small in size and useful up through 500 megacycles as either trimmer or tuning capacitor is now available. Produced at the Philips works in Holland, this new capacitor is brought to American amateurs and experimenters through Silver jobbers by the McMurdo Silver Co., Hartford, Conn.

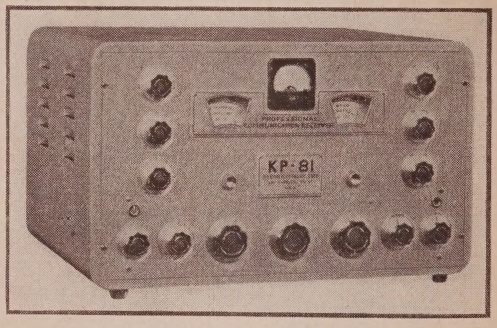


Less than ½″ in diameter, less than 1 7/16″ in length, Silver Model 619 capacitor provides 3 to 30 $\mu\mu$f at insulation resistance above 10,000 megohms, and at power factor of .007 at 1 mcs. and 8 $\mu\mu$f due to high-quality ceramic insulation. Both rotor and stator are of one-piece, low inductance, multiple aluminum cup construction. The rotor meshes with the stator to give a linear capacitance range of 27 $\mu\mu$f over 1080°, (three full turns of rotation). Rotor position once set is permanent by virtue of retention spring, while vibration does not affect capacitance since a long rotor bearing sleeve closely hugs a matching central ceramic insulator. Temperature coefficient is $+300 \times 10^{-6}$ per °C.

Weighing less than ¼ oz. Model 619 capacitors have two solder terminals, are so light they may be mounted directly by their connecting leads. Each is supplied with a low-loss phenolic mounting plate having two #25 mounting holes in 1″ centers. This interesting new capacitor mounts thereto by two ears which are given a slight twist with nose pliers after being inserted through appropriate slots in the insulated mounting plate.

Communications Receiver

A new communications receiver, incorporating many advanced features has been announced by the



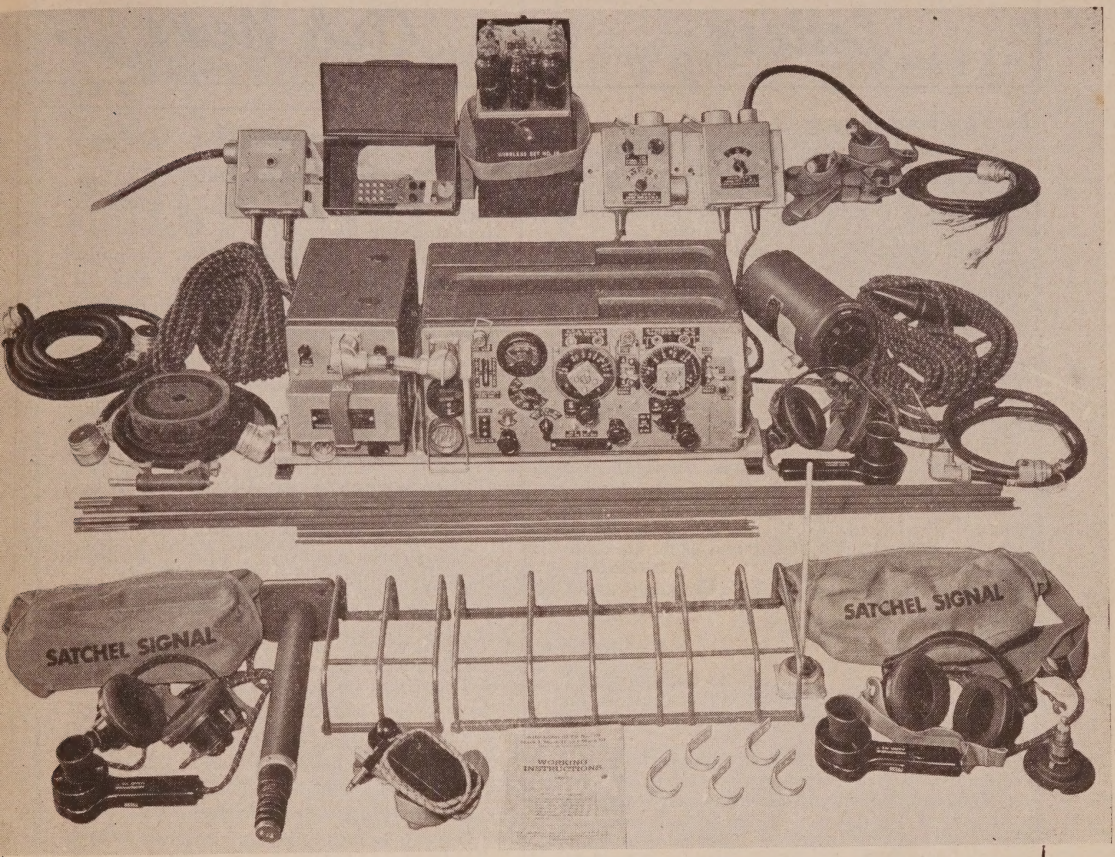
Pierson Electronic Corp., Los Angeles, Calif. The KP-81, is a 5 band 18 tube superhet. Frequency range from 550 kc to 40 mc. Two tuned r.f. or preselector stages, crystal filter, inter-channel adjustable signal squelch circuit, extremely high image ratio on all bands, high order of signal to noise ratio, automatic noise limits, and other features of the Pierson KP-81 are described in a bulletin available from the manufacturer at 533 East Fifth Street, Los Angeles 13, California.

Coaxial Dipole Antenna

Serdex, Inc. 91 Cambridge Street, Boston, Mass. announces a new coaxial dipole antenna, developed and engineered in their laboratories. The antenna is broadband from 144 to 148 mc. The model is 5

[*Continued on page 54*]

BRAND NEW COMPLETE TRANSMITTING AND RECEIVING SET



YOU GET 3 SETS IN ONE • 15 TUBES

Cost Approximately $1100
Parts Kit Alone Worth About $400

$78.50

Made by Zenith & Emerson for the British and Russians

F. O. B. Los Angeles, Calif. — No C. O. D.'s

SET NO. 1. For telephone and telegraph includes: 6 tube superheterodyne receiver and 6-tube MOPA transmitter with 807 final amplifier. Grid modulated for telephone. Specialized circuits make this set ideal for network operations. The frequency range of 2 to 8 megacycles includes the 80 meter and 40 meter amateur bands.

SET NO. 2. Consists of 235 megacycle transceiver that can be shifted to 144 or 225 megacycle amateur bands.

SET NO. 3. A complete inter-communication system using 3 control boxes and 3 combination headphones—push-to-talk microphone, providing inter-communication or remote control operation in an extremely flexible arrangement in 3 different locations.

POWER SUPPLY: This unit, including dynamotor, operates from a 12-volt storage battery. It may be disconnected and the set operated from AC power supplies.

These sets are ideal for mobile or marine installations.

Two complete antenna systems are included with mobile type mountings:

1. A 235 megacycle half-wave antenna.
2. A 12-foot unit with variometer loading to resonate the antenna system from 2 to 8 megacycles.

There are several extra sets of headphones.

3 CASES OF EQUIPMENT. The equipment included in the set fills three large packing cases. A complete description of every part covers three printed pages. The sets go direct to you in the original export packing cases.

These sets are ideally suited to licensed radio amateurs. They are also excellent for schools and colleges in need of fine laboratory equipment. Small commercial stations may buy this equipment at a fraction of its original cost.

TERMS — Money Order or Cashier's Check with Order. For California Sales add 2½% state sales tax.

CALIFORNIA RADIO AND ELECTRONICS CO.

711 No. Vermont Avenue — Dept. Q — Los Angeles 27, California

Letters

The YL's Frequency

215-11 111th Ave.
Sirs: Queens Village, N.Y.

How about keeping CQ a "Ham" magazine by having more articles like those by Jim Hill, W2JIH, and avoid things like The YL's Frequency.

The percentage of female subscribers is probably under 1% and it just doesn't make sense to get 99% disapproving of material.

W. C. Uzzell, W2BNX

150 Snediker Ave.
Sirs: Brooklyn 7, N.Y.

Congratulations on your initiative regarding the acknowledgment of YL's. Yours I believe is the first major magazine for amateurs to recognize us.

W1NVP's article will help greatly to gain our rightful place among the OM hams. Its further appearance every month will do much for us.

The article was timely with new FCC Station Licenses being issued. Most members of the YLRL Club are awaiting their Ticket and each one is deserving of being recognized.

Thanking you again for the YL's Frequency.

Sophie Lash

Becoming A Ham

43 Calhoun Ave.
Sirs: Pittsburgh 10, Pa.

There are a few important barriers in the road of the enthusiastic amateur.

First, learning enough about radio out of a book to build a transmitter, without someone to help you over the rough spots is just about as easy as picking up Advanced Algebra and trying to learn complex operations without a teacher. That is what I and a great many other aspiring amateurs are up against. No acquaintance of mine knows anymore about coils and condensers than I do and an experienced radio man has little time for showing "dumb amateurs" what makes radio tick.

Secondly, the parts situation is deplorable. There are but four radio stores in Pittsburgh (as far as I can discover) that deal solely in parts at all and these are usually so crowded that I have had to wait as long as 45 minutes to get waited upon and then only to find out that the part I wanted is as unobtainable as the moon. I find that the attitude of most older radio men towards the amateur is that the radio field is already over-crowded with men interested in radio so why should they help the amateur.

Finally there is a great dearth of radio books which have any simple schematics for beginners. The only book which I have found with any circuits an amateur could build by following the directions in the book is Alfred Morgan's First Radio Book for Boys. I started a set from this book in 1943 and couldn't get parts for it so I gave it up. Now, when I can get most of the parts I find that the pages on the radio set I want to make are torn out of the book and after applying to the Central Branch or the Main Branch of the Carnegie Library I am informed that this book is "out" and one applicant waiting on the reserved list.

As you see, I'm fairly well disgusted with the difficulties facing the beginner or amateur and thus resent the way your article makes it sound so easy.

Edgar Sack, Jr.

Club News

HAMFESTS

Southeastern States

Southeastern States Hamfest sponsored by Amateur Radio Club of Savannah will be held July 21, 1946 at the Savannah Vocational School, 214 West Bay St. Registration starts at 10:00 a.m. The program includes sports, refreshments, barbecue, and prize drawing. A special prize for holders of tickets purchased in advance will be awarded. Admission will be $2.00 for adults and 75c for children. Tickets may be purchased from Amateur Radio Club of Savannah, Box 1942, Savannah, Ga.

Peoria Amateur Radio Ass'n

The Peoria Amateur Radio Association Hamfest will be held at 10:00 a.m. Sunday, June 16th, at Pleasant Valley Park, near Dunlap, Illinois. Dunlap is fifteen miles north of Peoria.

There will be free refreshments and various prizes will be awarded. First prize will be a standard communications receiver. A hidden transmitter hunt will be held at 3:00 p.m. on 2 meters. Those attending are asked to bring their own receivers.

Games, including Bingo, and other forms of amusement will be arranged for the less technically minded and the XYL's. For the hams there will be demonstrations of new transmitting and receiving gear for ultra high frequencies.

Advance purchase of tickets entitles the holder to draw for an additional prize. Tickets are $1.50 each, 25 cents for children. Check or money order should be sent to Treasurer Walter Shoff, W9OPD, Treasurer Peoria Amateur Radio Association, 3026 Seventh Avenue, Peoria, Illinois.

Chicago Suburban Radio Association

The Chicago Suburban Radio Association continues to meet the fourth Friday of each month at the LaGrange Masonic Temple, LaGrange, Illinois. CSRA members were active throughout the war, contributing much toward the success of the WERS program in the Chicago area.

Each meeting has featured a speaker on some topic of general interest, including Royal Higgens of Eimec, Rex Munger of Taylor Tubes, Bill Hanna of Amphenol, and Walt Kean of Andrew Co.

The club has recently purchased a 350 watt gas

[*Continued on page 51*]



ONE OF THE WAR'S GREAT SECRETS!

NOW RELEASED FOR THE FIRST TIME!

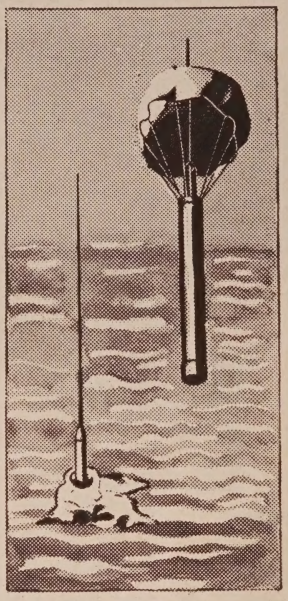
THE SONOBUOY

PORTABLE FM TRANSMITTER

This equipment was successfully used by the Army Air Forces to detect enemy submarines.

COMPLETE WITH 5 TUBES
(LESS BATTERIES)
(SET OF BATTERIES $2.50)

$17.50 Special



Weight 13½ lbs. (with batteries). Completely equipped with parachute, quarter wave collapsible whip antenna, and magneto-striction hydrophone (underwater microphone)

Easily convertible to:

—Portable Amplifier (P.A). —Transmitter. —Receiver.— Transceiver (Walkie-Talkie). Excellent for schools, geologists, explorers, licensed amateurs, etc.

SONOBUOY is thrown from patrol plane. Parachute lowers it into the water. Underwater microphone picks up submarine sounds which are relayed by the radio transmitter in the buoy to the patrol plane or a ship.

MORE RADIO HAM SHACK SPECIALS!

CONDENSERS OIL FILLED
AEROVOX - C. D. - SOLAR ETC.

5 Mfd	50 Vdc	$ .40
2 Mfd	600 Vdc	.60
4 Mfd	600 Vdc	.75
6 Mfd	600 Vdc	.80
8 Mfd	600 Vdc	1.10
10 Mfd	600 Vdc	1.35
10 Mfd	1000 Vdc	2.00
1 Mfd	2000 Vdc	.95
0.5 Mfd	2500 Vdc	3.50
1 Mfd	3000 Vdc	3.50
0.1 Mfd	7500 Vdc	4.50

BATH TUB OIL FILLED

Your choice . . . . . **25c ea.**

4	Mfd— 50 Vdc	0.1X2	Mfd— 600 Vdc
0.1	Mfd— 200 Vdc	0.1X3	Mfd— 600 Vdc
0.1X3	Mfd— 400 Vdc	0.25	Mfd— 600 Vdc
0.05	Mfd— 600 Vdc	1	Mfd— 600 Vdc
0.1	Mfd— 600 Vdc		

866 — 99c	6AG7 — $ 1.25	5CP1 — $6.95
6C4 — 75c	6AK5 — 1.60	100TS — 3.50
6AL5 — 60c	6AC7 — 95c	1N21 — 69c
VR150 — 75c	257B — 15.00	6SL7 — 1.00

RCA 813 — Extra Special — $9.95

SANGAMO MICA CONDENSERS

Type G3	.0005	Mfd—	20,000 Vdc—	$20.65
Type F3L	.0005	Mfd—	8000 Vdc—	8.16
Type "	.00025	Mfd—	8000 Vdc—	8.16
Type "	.005	Mfd—	8000 Vdc—	11.24
Type "	.004	Mfd—	8000 Vdc—	10.32
Type "	.003	Mfd—	8000 Vdc—	9.70
Type "	.002	Mfd—	8000 Vdc—	9.08
Type "	.006	Mfd—	6000 Vdc—	4.16
Type "	.007	Mfd—	5000 Vdc—	4.16
Type A2	.01	Mfd—	2500 Vdc—	.76
Type "	.002	Mfd—	2500 Vdc—	.37
Type "	.0022	Mfd—	2500 Vdc—	.37
Type "	.0005	Mfd—	2500 Vdc—	.19
Type "	.00036	Mfd—	2500 Vdc—	.19
Type "	.000027	Mfd—	2500 Vdc—	.19
Type "	.01	Mfd—	1200 Vdc—	.38
Type "	.003	Mfd—	1200 Vdc—	.22
Type "	.0051	Mfd—	1200 Vdc—	.22
Type "	.0001	Mfd—	1200 Vdc—	.18

20% DEPOSIT REQUIRED WITH ALL ORDERS

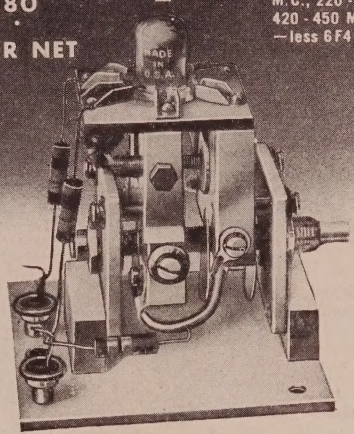
RADIO HAM SHACK INC.

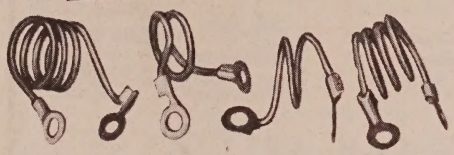
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$10.80
AMATEUR NET

Price includes 3 sets of coils covering 144-148 M.C., 220 - 225 M.C., 420 - 450 M.C. bands —less 6F4 tube.





IT'S READY FOR YOU NOW
THE NEW CARDWELL V.H.F.
OSCILLATOR KIT

Here it is...precision engineered with a new technique...simple...effective . . . with revolutionary stability for 140-450 M.C. bands.

This is traditional Cardwell quality. Make no mistake about that. It is ideally suited as a local oscillator for super-heterodyne receivers, as a plate modulated oscillator for low power transmitter or transceiver, driver unit for amplifier tube in higher powered transmitter, V.H.F. signal generator, etc., etc.

It took a little time to catch up with the demand on this hot little V.H.F. Oscillator kit. Perhaps you were disappointed before. Now you can get one.

SEE YOUR DEALER TODAY

Cardwell Catalog No. 46, FREE, upon request

THE ALLEN D. CARDWELL
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MAIN OFFICE & FACTORY
96 WHITING STREET, PLAINVILLE, CONN.

Calls Heard

[Numeral following call letters indicates signal strength]

D. A. Summers, 143-07 Sanford Ave., Flushing, N. Y.
April 12 and 13, 1946
(14 mc)

G9AA; G7BA; SU1CX; EP1C; YI3C; F2CV; TG9FG; OA4R; EI2N; FM8AC; OZ7F; ON4G; YV5ADY; YV5AP; HB9CE; HB9CX; HB9BN; HB9BN; LU6DJK; LU8EN; CM2SW; CM2BC; CO2RZ; CO5FL; PY6AW; PY1GJ; PY4BR; HC1FG; XE1AM; XE1A.
(Stations logged between 2150 and 0203 GMT)

A. M. Bucksbaum, W9WGZ/FK8, Noumea, New Caledonia
February 24 to March 1, 1946
(28 mc)

K6CGK; W4EPT/K6; W6TRN/K6; W1NSS/-K6; W9KOA/K6; W2JQJ/K6; W9DCH/Iwo Jima; VK5BF; W4GGX; 5BIB; 6BIP; 6DLN; 6ABR; 6BZF; 6AED; 6QLP; 8WAL; 8BZZ; 9BAB; 9ERA; 9OGT; 9TOZ; 9VHR; 9RNN; 9POY.

Mobile Marine, LST931, New Caledonia to Hawaii
March 8, 1946
(28 mc)

W2KQT/KB6; W6KKB/KB6; W6QKB/K6; W9BPZ/KB6; W3EHD/KB6; W2NO/Midway; W9JQJ/Saipan; K6IQM; W9KLE/K6; W1NSS/-K6; K6TCW; VK2ADK; VK2VP; VK3AG; KA3CB; VE4XX; W5JZQ; 5IWQ; 6JGJ; 6UPR; 6DEP; 6JAW; 6OPB; 6OEF; 6QBL; 6LFT; 6KNH; 2EUG/6; 6NYQ; 6EOP; 6PGP; 7AUZ; 7IVA; 7CEC; 8VVZ.

Joseph N. Honer, RM3/c, Mobile Marine, Central China Sea
February 26 to 28, 1946
(28 mc)

W6UFY/KA-7; KA2NJ-7; KA1AF; KA1AS-7; KA1AB-9; W2KQT/KB6-7; W2HLW/Saipan-7; W5CQ/KB6-7; W6PUZ/Tinian-8; W8HGW/Saipan-6; W7HCQ/KB6-9; W6QKB/KB6-9; W1-NXY/KB6; W9QCJ/KB6; W3EHD/KB6-6; VS6DY-6; W1WSW(?)/J5-6; W6NFL/J5-7; W7-FTA/K7-8; KB4BX/K6-8; W6EKE/K6-7; W9-JOE/K6; W4IDL/K6-9; W9HWT/K6-7; W9IIL/-K7-6; VE5VP-9; W6PJW-6; 6RX/5; 6RVU-5; 6JUW-9; 6UKO-6; 6PZK-7; 8QBL/6-7; 6UVS-7; 7AKQ-9; 7ABB-7; 7KUW-7; 7HEA-8; 7JHB-7; 7IKY-6; 7FSW-7; 8ERG-5; 8MJP-7; 9WUG-7; 8ETC/9-8; 4ZJA(?)-8.

Northern Ryukus
February 27 to March 3, 1946
(28 mc)

VK5JS-6; VE3APF-7; W5BYZ/KA-6; W6PUZ/-KB6-7; W6QKB/KB6-6; W6MJU/KB6-7; W6-KBQ-7; 6MPZ-6; 6FF-7; 6QKT-9: 6LIQ-5; 6FS-4; 6ULL; 7EYF-7; 7HCQ-8; 9TQK-6; 8UKS-8; 8IPT-8.

HARRISON HAS IT!

★HSS

Stromberg-Carlson DYNAMOTORS

Compact, well-constructed unit, excellent for mobile xmitters, amplifiers, etc. Ball bearings, good efficiency. Made for military use.

INPUT	OUTPUT
12 V at 16.8 A	680 V at 210 Ma
6 " " 16 "	300 " " 210 "
6 " " 21.5 "	265 " " 300 "

3¾" dia. x 6½" long. 6 lb. 12 oz., with mounting plate. Brand New. HSS SPECIAL..... **$8.95**

HSS TUBES

All new, fully guaranteed HK24G (3C24/VT204) an FB Tube for VHF. 90 Watts Class C output. Gov't inspected. Regular Amateur Net Price was $9.00, reduced to $6.00; but Harrison sells them for only **$1.69 ea.**

3 for $4.45

Raytheon RK-63. Regular price $22.00. Special **$9.85.**

RK-38—**$5.95**

RK-39—**$1.75**

Navy tested and accepted 805's—$6.90. 807's —$1.29.

Eimac 304-TL. Handle a KW cool! Slightly used in radar pulsing, tested and guaranteed OK. Reg. net $50. HSS Special... **$7.50**

ROTARY COAXIAL COUPLING

Having trouble coupling to your rotary beam? Feed it efficiently through this constant impedance slip-ring coupling. Made for Signal Corps by Lapp Insulator Company, one of the best antenna system manufacturers. Surge impedance of 52 ohms will match most coaxial cable.

Head, 1⅞" dia. finely machined from brass. Copper feed line ⅞" dia. is 51" long.

Outlets at top and bottom take standard AN coaxial plugs (or may be connected permanently). HSS..... **$7.75**

LONG WAVE RECEIVERS

Navy Model RAK 7

15 to 600 Kilocycles. 6 Tube Receiver with AVC, Noise Limiter — Band Pass Filter — Tuneable Audio Filter — Band Switching — Precision Dial — 3 tube Voltage regulated Power Supply for 115 V — 60 cycle A. C. Optional Battery Operation. Excellent for Marine and Aviation Work.

Brand new in original crate, complete with power supply, Steel Chest full of spare tubes and parts, full instructions. **$79.50**

Discount on Quantities

HAM XTALS

Here is the *value* in ham band crystals that tops anything you have ever seen!

Carefully manufactured to exacting Signal Corps specifications. Very active oscillators. Stainless steel electrodes. Neoprene gasket seals out moisture and dust. Calibration accuracy. .01% over full temperature range!

40 meters—in DC-35 holder. (½" Pin spacing.) Fits into Millen 33202 socket.

80 meters—in DC-34 holder. (¾" Pin spacing.) Fits into Amphenol 33-3 socket.

Specify frequency desired with acceptable limits. Quantity limited..... **90c**

(Three or more—postpaid.)

PHOSPHOR BRONZE ANTENNA WIRE

Strong, won't stretch. 7 strands No. 18 (10 ga) 100 foot coils. List price $6.00. **HSS—$2.39.**

★ HARRISON SELECT SURPLUS

Your assurance of good, usable, guaranteed surplus material at sensationally low prices—top value always! Come in and browse through our large, entirely separate HSS Department (*Harrison Select Surplus*).

HARRISON HAS IT!

ALL STANDARD LINES
NEW SKY CHAMPION

By special chartered cargo-plane, we obtained our initial stock of the new Hallicrafters S-40 Sky Champion receivers! They're going fast so rush in your order. Complete..... **$79.50**

[We'll do everything possible to give you the very best service on all makes and models of receivers, transmitters, etc.— Keep sending in your orders. 1N34]

CRYSTAL DIODE

This is the germanium rectifier crystal specified in recent articles for noise limiters, field strength, meters, etc. **$1.80**

TEST EQUIPMENT

Shipments are getting bigger and better! Send us your order *now* for quickest delivery.

Dumont — GE — Hickok — Precision — RCP — RCA — Shallcross — Simpson — Supreme — Triplett — Weston.

TWIN RIBBON CABLE

Amphenol's sensational new transmission line. In stock in 75, 150 and 300 ohm surge impedance. Per foot..... **3c**

PLASTIC PLIERS

New SPECO all plastic long nose pliers. Light, strong, very handy..... **89c**

☞ CQ—L. I. HAMS! ☜

Our **JAMAICA BRANCH** is the most handy place on the Island to get your Ham and Service material. Right at the bend in Hillside Ave. Complete stocks—plus direct lines to make our N. Y. store and warehouse stocks immediately available. **Drop in—often!**

BOAT OWNERS!

Immediate delivery of Islip Model MRT-10 Marine Radio Telephones. 10 Watt carrier output. 5 channel selector switch. Push-talk handset. For 6 or 12 Volt operation, 8½" x 8½" x 12", complete! Well engineered and constructed. With six crystals for three channels **$195**

Coast Guard vertical rod antenna $45. Real radiation efficiency!

RECORD CHANGERS

Garrard.....	$65.85
Webster No. 56-1..	26.66
Webster No. 50...	21.17

STEEL ? ?

It's scarce, but we've just received shipments of several truckloads! Chassis—racks — panels — cabinets — boxes — brackets — etc., all sizes. Parmet — Bud — Middletown — ICA. Get yours now!

10A DIPOLE

Made by S.C. Labs. Light-weight, all aluminum adjustable elements and mounting pole. Machined center coupling insulator. Good value for little money! Complete with instructions..... **$6.75**

PREMAX Antennae and elements in stock.

We are **FACTORY AUTHORIZED DISTRIBUTORS for the top quality manufacturers and we now have in stock lots more new, latest improved production Ham gear! Visit our stores today, for *everything* you need. We promise you fresh, clean material—quicker—at the lowest current prices —and, above all, our sincere desire to be of friendly, helpful service.**

MAIL ORDERS?—Certainly! Just list *everything* you want (items in this ad, or *any* ad, magazine or catalog) and include deposit.

73 de

Bill Harrison, W2AVA

HAM HEADQUARTERS Since 1925!

HARRISON RADIO CORPORATION

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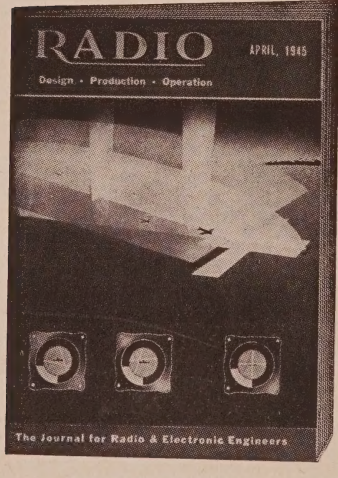
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RADIO MAGAZINES Inc., 342 Madison Ave., N.Y.C.

3 TUBE KILOWATT

[*from page 22*]

the 75 $\mu\mu$f screen tuning capacitor described in the circuit discussion. PA tank tuning capacitor is 50 $\mu\mu$f per section split-stator 5000 v breakdown mounted on 1" standoff insulators.

Coil data for the ten meter model shown:—L1, 1¼" OD—7¾ turns, L2, 1¼" OD—11 turns, L3, 1⅛" OD, 5 turns tapped ¾ turn from top end, L4, 3⅛" OD—6 turn, center tapped with 1⅜" space allowed at centertap for the swinging antenna link. Output tank coil is 4" long. Coil data for other frequencies can be taken directly from tables. Commercial units may be utilized if desired.

L1 and L2 are mounted on their respective tuning capacitors in such a manner that they are side by side and separated by a space of approximately ¼".

All exciter and bias voltages are brought out the rear of the chassis at a binding post strip, while the +400 volts for PA screens and +2500-3000 volts for PA plates are brought out through separate porcelain feed-through bushings. Screen overload protection is very important. A 100 ma fuse in the screen line will safeguard the tubes in the event of excessive screen current.

The AT-340's are mounted in jumbo 5-pin sockets and it will be noted that the tubes are so designated that they should be mounted with the bulb nearly on a level with the chassis for most efficient shielding. In this particular transmitter, the sockets were hung 1 inch below the chassis on standoff insulators.

Tuning Procedure

For fourth harmonic operation, the oscillator plate circuit is first tuned to output frequency and the grid current adjusted to maximum. The third harmonic circuit is then adjusted until a considerable rise is noted in amplifier grid current. The oscillator plate circuit should show smooth tuning resonance and if it does not, the screen grid excitation should be decreased by tapping down the coil.

Normal currents for the transmitter are:

Oscillator Plate Current	60 ma
PA Grid Current	15 ma
PA Screen Grid Current	30 ma
PA Plate Current	330 ma

For frequencies above 15 mc it is advisable to neutralize the final amplifier to conserve driving power. This is accomplished by using feed-through bushings between the tubes which support metal tabs adjacent to the tubes. One inch square plates spaced about one-half inch from the tube envelope should be sufficient.

CLUB NEWS

[*from page 46*]

driven generator, which with the club transmitter will form the nucleus of an excellent emergency station.

Club officers are Bill Nolan, W9TQL, President; Jack Woodruff, W9PK, Vice President; Joe Juel W9BGC, Secretary; Bill Burda, W9PPQ, Treasurer; and Elmer Sweeney, W9FCN, Custodian.

Greenville (S.C.) Amateur Radio Club

The Greenville Amateur Radio Club has reorganized and welcomes inquiries from local hams. Address S. Bates, Greenville Amateur Radio Club, 20a Ackley Road, Greenville, South Carolina.

Club News is reserved for notices and announcements by amateur radio clubs throughout the country. Correspondence should be received no later than the 5th of the preceding month for publication in any issue. This is particularly important when announcing special activities such as Hamfests.

CQ DX

[*from page 38*]

timers and his present signal will work a lot of DX for him. Then ZL1BY is ex-Z12CI, and who doesn't remember that guy. Apparently Bill has changed his location and is gradually getting set for the first DX contest that might pop up.

W9EGQ reports that W9SVZ has heard FO8FN on approximately 3700 kc. Likewise Herb says W6POZ and W9LLM/6 really must be pouring out good phone signals because they have some of the Middle West fellows talking about it.

Well, gang, that just about winds up this bull session and, if the 10 meter band stays as flat as it is now, how about shooting in some station photographs or any bit of news you can scrape up regarding some of the old DX boys you think would be of interest to the gang as a whole? Until we get the 20 and 40 meter bands, we're going to have to keep this column active for the DX man and from the looks of it 10 meters isn't going to be much help. I am interested in getting your reactions on whether or not we should revive the zones as well as should we count the pre-war countries or just the post-war countries. Before we come out with any positive statement on what we are going to do in this direction, we'll get a few more ideas from you fellows and I hope in this way we will come up with a plan that will please most everyone. There are a few fellows who would like to see the world divided into more than 40 zones; however, at this point I think the majority feel that the zones were o.k. as we knew them before the war. From the looks of things we will probably wind up in showing both pre-war and post-war totals. More on this later.

That's the works for this time. See you in July.

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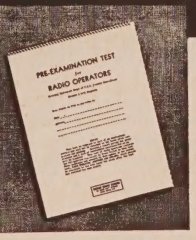
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UHF

by Josephine Conklin, W9SLG

YOU MAY HAVE NOTICED, in *CQ* for April, 1946, that there is a possibility that this magazine will carry a VHF or UHF column, provided that the readers will kick through with lots of interesting data that will keep it going. Of course, as this is written, there has been no time for the April issue to be received, and correspondence to come back to us. With the ten-meter band opening up nicely with short skip, however, there should be news of six-meter DX any day now.

Two-Meter DX

Last month we mentioned the Miami reception of 2½-meter signals from several Baltimore stations owned by Naval Research Laboratory engineers. Now we find more about such things. Dr. Newburn Smith of the National Bureau of Standards was saying the other day that one of the Army airport towers got mixed up with an Arkansas tower—presumably both using 116.10 mc. Dr. Smith said that the operators at La-Guardia field in New York are no longer showing much interest when Florida towers are heard there on that frequency. Perhaps hams will have little interest in these facts now, except for "what might have been" had the band remained on 2½ meters. There is much less likelihood of that sort of thing on 2 meters. But it does indicate that the six-meter band probably did open up at the same time and between the same points. How about some of you Florida boys getting on and giving the boys a six-meter contact? W4DRZ is back on the air down there—how about it, Bud?

A number of stations report a strong interest in keeping active on 2 meters, and another group promises activity on 6 meters, in the Washington, D.C., area. Mel Wilson, W1DEI/3, picked Bill up at the Naval Research Laboratory gate a while ago and talked about six-meter activity. His brother Web, W1QB, however, is about to take off for a conference in England on the subject of navigational aids. Heck, all of these hams are going technical on us.

While on the subject of DX, Lieut. J. M. Jones, USN, who is working on Navy radioteletype for ships, said recently that he was on a ship in Puget Sound, using one of these Navy Model TBY walkie-talkies (28-80 mc modulated oscillator and superregen detector with r-f stage and crystal calibrator) on a big ship antenna. He heard a W9 in Chicago and raised him—although the TBY puts out only ½ watt. Our guess is that this was at the 28 mc end of the frequency range of the set, but it does illustrate what can be done on this band under proper conditions. It's a lot

more than we have done here on that band! Incidentally, the TBY is being sold on the surplus market at around $34.50, but it does not qualify as crystal-controlled equipment suitable for our bands. It should not be difficult to cut it down to the two-meter band, though.

We see that the English hams are allowed 25 watts on 58.5 to 60 mc. It looks like we shall have to cover 50 to 60 mc in our receivers, and look the whole band over, if we want to avoid missing a trans-Atlantic contact.

Receiver Converters

Work on the 28 mc band up to the time when the FCC decided we were on 14 mc instead, led us to the conviction that we should not try to use all-band receivers for really serious ten meter work. Since that time, we have tried another receiver and found that it met the image interference problem quite well, although we have not had a chance up to this time to check its image ratio and sensitivity on the Navy Model LP signal generator that we used on several other sets. However, in order to eliminate images completely, or at least to move them out of the ham band, it will take a higher intermediate frequency than around 455 kc. Our old S-10 Ultra-Skyrider, using about 1.6 mc as an intermediate frequency, gives no image trouble. The real answer seems to be to have a high intermediate frequency, or to use a good converter in front of the all-band receiver.

Looking into some of the commercial all-band receivers, it seems that the construction is not too promising at the ten-meter end of the scale. This situation, again, can be met by using a specialized VHF receiver, or placing a good converter in front of the all-band receiver. How about a few interesting articles, with pictures, of suitable designs of converters that have been designed and built by our readers?

Russian Tank Sets

Several of the gang have purchased the surplus Russian tank sets that have been sold recently at around $78.50, as appeared on page 51 of the April issue of *CQ*. One of the parts is a 235 mc receiver. We wish to caution our receivers about changing the frequency of this VHF set to the present amateur band, unless it is done in some manner so that it may be restored to the old frequency readily. We cannot give you the reason for this recommendation just yet, but no doubt you will get the word soon.

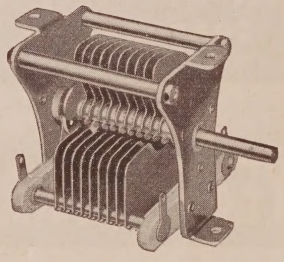
That's all for now—but let's hear from you, gang, and give us all the latest news on antennas, equipment, and DX above 30 mc. Remember the address—Mrs. Josephine Conklin, care of Conklin Radio Company, 6800 Clarendon Road, Bethesda 14, Maryland. 73.

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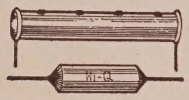
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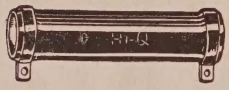
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PARTS AND PRODUCTS

[*from page 46*]



feet high with a tubular mast that is both support and feed line and to which is attached a mounting bracket for securing the mast or house. Serdex Inc., states that it has other coaxial antenna models with patented gas line features available for commercial use.

FLASHOVER

[*from page 24*]

shown in circuits *A*, *B*, *C* and *D*, one may figure that he is flashover-safe with a small-spaced condenser because the two sections are in series and insulated from the ground on each side of the high voltage. A study of the circuit will show that this is fallacious reasoning.

In the first place, only one-half of the circuit functions at one time, each half operating alternately. Thus one can assume, for insulation problems, that only one condenser is involved at any one time, and the peak r-f voltage plus the d-c voltage (at 100% modulation in a phone rig) will be four times the d-c voltage across each half (see circuits *A* and *B*). The spacing therefore will have to be such as to withstand this. By inserting a mica condenser *C5* and changing circuits *A* and *B* to circuits *C* or *D*, the d-c voltage is isolated from tuning condenser *C2*, and the spacing need only be able to withstand the peak r-f voltage. This will be about twice the d-c

voltage. The size and cost of such a circuit is considerably less, even when one takes into consideration the cost of the extra mica condensers. However, as has been stated, there may be some trouble in mounting the tuning condenser which must have its shaft insulated both from the hand and from the chassis or panel.

Following up the circuits still further, it can be seen that if a single condenser is substituted for the split-stator condenser *C2* in circuits *B* and *D*, and the ground return made from the center tap of the tank coil through a mica condenser, the variable condenser spacing will again have to be doubled so that no savings are effected because of the increased cost of the tuning condenser. The reasoning behind this statement is that insofar as the d-c and r-f voltage across it are concerned, the split-stator condenser *C2* is actually two condensers in series, and the voltage it will withstand is therefore twice that which either half will take by itself. A single condenser substituted must be able to withstand the entire load.

In the final analysis, it may be stated that the mica condensers used to insulate the d-c voltage in phone rigs should be rated at least twice the voltage they are to insulate; and in c.w. rigs at least equal to the d-c voltage.

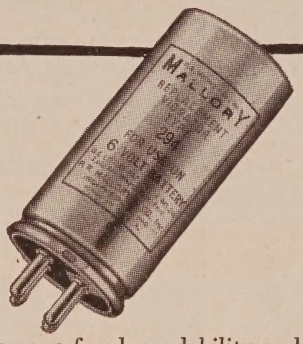
Fig. 2 shows three curves. The lowest is the absolute spacing to withstand certain voltages. Thus in the problem stated, for a phone rig with a plate supply of 750 volts, and no isolating mica condenser in the circuit to hold the d-c voltage component off the tuning condenser, about 3000 volts would be developed, and the spacing would be .070 inches just to "hold" that voltage. Allowing for a safety factor of, say, 100%, the spacing would have to be .140 inches.

If the isolating condensers should be used, the voltage across the tuning condenser would only be equal to twice the plate voltage. Thus in the problem stated, it would be 1500 volts. Absolute spacing for that voltage is .050 inches. Allowing for a 100% safety factor to handle moisture, line surges and the like, would result in a spacing of .100 inches which is what is shown in the highest, the phone rig curve for a 750-volt plate supply.

Since c.w. requires only a voltage rating equal to the d-c voltage, if the tuning condenser is suitably isolated by the technique described, the spacing for a c.w. rig with a 750-volt plate supply would be about .025 inches absolute. Allowing for 100% safety factor would require a spacing of .050 inches, which is shown in the c.w. or middle curve for a 750-volt rig.

(*The author acknowledges with thanks the help from the Allen D. Cardwell Mfg. Co. article on condenser spacing, used in preparation of this article.*)

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FCC RULES

[*from page 20*]

further action of the Commission. When any order of revocation has become final, the person whose license has been revoked shall forthwith deliver the station license in question to the inspector in charge of the district in which the licensee resides.

Sec. 12.70 Modification of station license.—(a) Whenever the Commission shall determine that public interest, convenience, and necessity would be served, or any treaty ratified by the United States will be more fully complied with, by the modification of any radio station license either for a limited time, or for the duration of the term thereof, it shall issue an order for such licensee to show cause why such license should not be modified.

(b) Such order to show cause shall contain a statement of the grounds and reasons for such proposed modification, and shall specify wherein the said license is required to be modified. It shall require the licensee against whom it is directed, to be and appear at a place and time therein named, in no event to be less than 30 days from the date of receipt of the order to show cause why the proposed modification should not be made and the order of modification issued.

(c) If the licensee against whom the order to show cause is directed does not appear at the time and place provided in said order, a final order of modification shall issue forthwith.

Call Signals

Sec. 12.81 Assignment of call signal.—(a) The calls of amateur stations will be assigned systematically by the Commission with the following exceptions:

(1) A specific unassigned call may be reassigned to the most recent holder thereof;
(2) A specific unassigned call may be assigned to a previous holder if not under license during the past five years;
(3) A specific unassigned call may be assigned to an amateur organization in memoriam to a deceased member and former holder thereof;
(4) A specific call may be temporarily assigned to a station connected with an event, or events, of general public interest.

(b) An amateur call will consist of a sequence of 1 or 2 letters, a numeral designating the call area, and 2 or 3 letters. The call areas are as follows:

No.
1. Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
2. New York, New Jersey.
3. Pennsylvania, Delaware, Maryland, District of Columbia.
4. Virginia, North and South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Puerto Rico and Virgin Islands.
5. Mississippi, Louisiana, Arkansas, Oklahoma, Texas, New Mexico.
6. California, Hawaii and Pacific possessions except those included in area 7.
7. Oregon, Washington, Idaho, Montana, Wyoming, Arizona, Nevada, Utah, Alaska and adjacent islands.
8. Michigan, Ohio, West Virginia.
9. Wisconsin, Illinois, Indiana.
0. Colorado, Nebraska, North and South Dakota, Kansas, Minnesota, Iowa, Missouri.

(o or zero)

Sec. 12.82 Transmissions of call signals.—(a) An operator of an amateur station shall transmit the call of the station called or being worked and the call assigned the station which he is operating at the beginning and end of each transmission and at least once every 10 minutes during every transmission of more than 10 minutes' duration. In the case of stations conducting an exchange of several transmissions in sequence, with each transmission less than 3 minutes' duration, the call of the communicating stations need be transmitted only once every 10 minutes of operation as well as at the beginning and at the termination of the correspondence.

(b) In addition to complying with the requirements of paragraph (a) above, an operator of an amateur station operated as a portable or mobile station using radiotelegraphy shall transmit immediately after the call of such station, the fraction-bar character (DN) followed by the number of the amateur call area in which the portable or mobile amateur station is then being operated, as for example:

Example 1.—Portable or mobile amateur station operating n the third amateur call area calls a fixed amateur station: W1ABC W1ABC W1ABC DE W2DEF DN 3 W2DEF DN 3 W2DEF DN 3 AR.

Example 2:—Fixed amateur station answers the portable or mobile amateur station: W2DEF W2DEF W2DEF DE W1ABC K.

Example 3.—Portable or mobile amateur station calls a portable or mobile amateur station: W3GHI W3GHI W3GHI DE W4JKL DN 4 W4JKL DN 4 W4JKL DN 4 AR.

When telephony is used, the call of the station shall be preceded by the words "this is" or the word "from" instead of the letters "de," followed by an announcement of the geographical location in which the portable or mobile station is being operated.

Example 4.—Portable or mobile amateur radiotelephone station operating in the third call area calls a fixed amateur station: W1ABC W1ABC W1ABC "this is" or the word "from" W2DEF W2DEF W2DEF operating portable (or mobile) three miles north of Bethesda, Maryland, over.

(c) When telephony is used, the transmission of call prescribed by subsections (a) and (b) of this section may be made by the person transmitting by voice in lieu of a duly licensed operator provided the licensed operator maintains the control required by section 12.28.

(d) When using telephony, phonetic aids to identify the call of the station may be employed. To avoid confusion, however, the names of countries, states, or cities shall not be used for this purpose.

Portable and Mobile Stations

Sec. 12.91 Requirements for portable and mobile operation.—An amateur station may be operated as a portable station on any authorized amateur frequency and as a mobile station on any authorized amateur frequency above 25 Mc.

Sec. 12.92 Special provisions for portable stations.—Prior to operating an amateur station as a portable station, the licensee shall give written notice to the inspector in charge of the district in which the portable operation is intended. This notice shall state the station call, the name of the licensee, the date or dates of proposed operation, and the contemplated portable station location as specifically as possible. An amateur station operated under the provisions of this section shall not be operated during any period exceeding 1 month without giving additional notice to the inspector in charge of the radio inspection district in which the station is intended to be further operated. nor for more than 4 consecutive periods of 1 month each at the same location. This section does not apply to operation on frequencies above 25 Mc.

Sec. 12.93 Special provisions for non-portable stations.—The specific provisions of these rules relative to portable stations are not applicable to a non-portable station except that—

(a) An amateur station that has been moved from one permanent location to another permanent location may be operated at the latter location, in accordance with the provisions governing portable stations (including notice to the inspector in charge of the district in which the station is located) for a period not exceeding 4 consecutive months, but in no event beyond the expiration date of the license, provided a formal application for modification of license to change the permanent location has been filed with the Commission.

(b) The licensee of an amateur station who changes residence temporarily and moves his amateur station to a temporary location associated with his temporary residence, or the licensee-trustee for an amateur radio society which changes the normal location of its amateur station to a different and temporary location may use the station at the temporary location if the station is to remain there for a period of not more than 4 months and the following requirements are met:

(1) Advance notice in writing shall be given by the amateur station licensee or licensee-trustee to the Commission in Washington, D. C., and to the inspector in charge of the district in which the station is to be temporarily operated.

(2) Similar notice shall be given for each change in station location and for transfer of the station to the former permanent location, or to a new permanent location before the transmitting apparatus is operated.

(c) When the station is operated under the provisions of this section the calling procedure specified in section 12.82 shall be used, including transmissions of the fractional bar character when telegraphy is used followed by the number of the amateur call area in which the station is being operated. When telephony is used, an announcement shall be made of the geographical location in which the station is being operated.

Use of Amateur Stations

Sec. 12.101 Points of communications.—An amateur station may be used to communicate only with other amateur stations, except that in emergencies or for test purposes it may also be used temporarily for communication with other classes of stations licensed by the Commission, and with United States Government stations. Amateur stations may also be used to communicate with any radio station other than amateur which is authorized by the Commission to communicate with amateur stations. Amateur stations may be used also for transmitting signals, or communications, or energy, to receiving apparatus for the measurement of emissions, temporary observation of transmission phenomena, radio control of remote objects, and for similar experimental purposes.

JAMES KNIGHTS

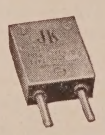
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Crystals

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GOOD QSO'S AT BAND ENDS

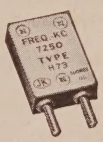
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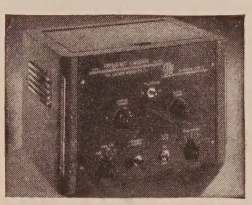
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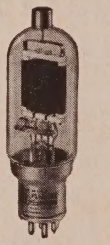
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Sec. 12.102 No remuneration for use of station.—An amateur station shall not be used to transmit or receive messages for hire, nor for communication for material compensation, direct or indirect, paid or promised.

Sec. 12.103 Broadcasting prohibited.—An amateur station shall not be used for broadcasting any form of entertainment, nor for the simultaneous retransmission by automatic means of programs or signals emanating from any class of station other than amateur.

Sec. 12.104 Radiotelephone tests.—The transmission of music by an amateur station is forbidden. However, single audio-frequency tones may be transmitted for test purposes of short duration for the development and perfection of amateur radiotelephone equipment.

Allocation of Frequencies *

Sec. 12.111 Frequencies for use of amateur stations.—(a) The following bands of frequencies are allocated for use by amateur stations:

(1) Below 25 Mc	(2) Above 25 Mc
1750 to 2050 kc	28 to 29.7 Mc
3500 to 4000 kc	50 to 54 Mc
7000 to 7300 kc	144 to 148 Mc
14000 to 14400 kc	1215 to 1295 Mc
	2300 to 2450 Mc
	5250 to 5650 Mc
	10000 to 10500 Mc
	21000 to 22000 Mc

(b) The band of frequencies 420 to 450 Mc is allocated for use by amateur stations (and temporarily by other services for special air navigational aids) subject to the limitation of 50 watts peak antenna power.

(c) The band of frequencies 235 to 240 Mc is allocated for use by amateur stations until January 1, 1949; the frequency band 220 to 225 Mc is allocated for use by amateur stations beginning January 1, 1949.

(d) Amateur stations may be operated with types A-0, A-1, A-2, A-3, A-4 and special emission for frequency modulation on the frequency band 27.185-27.455 Mc (allocated for operation of scientific, industrial and medical apparatus).

Sec. 12.112 Use of frequencies above 30000 Mc.—Licensed amateur stations may be operated, subject to further order of the Commission, with any type of emission authorized for amateur stations, on any frequency or frequencies above 30000 Mc.

Sec. 12.113 Individual frequency not specified.—Transmissions by an amateur station may be on any frequency within any authorized amateur band. Sideband frequencies resulting from keying or modulating a carrier wave shall be confined within the authorized amateur band.

Sec. 12.114 Types of emission.—All bands of frequencies allocated to the amateur service may be used for the transmission of type A-1 emission, and for type A-0 emission for short periods of time when required for authorized remote control purposes or for experimental purposes.

Sec 12.115 Frequency bands for additional types of emission using amplitude modulation.—The following additional types of emissions using amplitude modulation may be used on the following bands of frequencies:

28.1	to	29.7 Mc	A-3
50	to	54 Mc	A-2, A-3, A-4
144	to	148 Mc	A-2, A-3, A-4
235	to	240 Mc	A-2, A-3, A-4
420	to	450 Mc	A-2, A-3, A-4, A-5
1215	to	1295 Mc	A-2, A-3, A-4, A-5
2300	to	2450 Mc	A-2, A-3, A-4, A-5
5250	to	5650 Mc	A-2, A-3, A-4, A-5
10000	to	10500 Mc	A-2, A-3, A-4, A-5
21000	to	22000 Mc	A-2, A-3, A-4, A-5

Any type of emission may be used by amateur stations on amateur frequency bands above 1215 Mc.

Sec. 12.116 Additional bands for radiotelephony.—Amateur stations may be used for radiotelephony with amplitude modulation (type A-3 emission) in the frequency bands 3900 to

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**The frequencies specified in these rules may not be used by amateurs except pursuant to and subject to the limitations and restrictions prescribed by Commission Orders. The frequencies and types of emission which may be used by amateurs as of April 1, 1946, 3:00 A. M. EST, are prescribed in Commission order No. 130-D. The use of additional frequencies will be authorized from time to time by modification of Order No. 130-D. The assignment and use of all frequencies below 25 Mc contained in these regulations are subject to change in accordance with the Commission's final report of allocations below 25 Mc, in Docket Proceedings No. 6651. (Editor's Note: It is assumed that the band 27.185 to 27.455 Mc, referred to in Sec. 12.134, should have been included under Sec. 12.111. The 21 meter band is not yet available for amateur use.)*

4000 kc and 14150 to 14250 kc, provided the station is licensed to a person who holds an amateur operator license endorsed for class A operating privileges, and actual operation and control of the station is maintained by an operator holding class A privileges.

Sec. 12.117 Frequency modulation.—The following bands of frequencies may be used by amateur stations for frequency-modulated radiotelephone transmissions and for radiotelegraph transmissions employing carrier shift or other frequency modulation techniques:

29	to	29.7 Mc	1215	to	1295 Mc
52.5	to	54 Mc	2300	to	2450 Mc
144	to	148 Mc	5250	to	5650 Mc
235	to	240 Mc	10000	to	10500 Mc
420	to	450 Mc	21000	to	22000 Mc

Equipment and Operation

Sec. 12.131 Maximum authorized power.—Except on frequencies within the band 420-450 Mc (where peak antenna power shall not exceed 50 watts), each amateur transmitter may be operated with a power input not exceeding 1 kilowatt to the plate circuit of the final amplifier stage of an amplifier-oscillator transmitter or to the plate circuit of an oscillator transmitter An amateur transmitter operating with a power input exceeding 900 watts to the plate circuit shall provide means for accurately measuring the plate power input to the vacuum tube or tubes supplying power to the antenna.

Sec. 12.132 Power supply to transmitter.—The licensee of an amateur station using frequencies below 144 Mc shall use adequately filtered direct-current plate power supply for the transmitting equipment to minimize modulation from this source.

Sec. 12.133 Purity and stability of emissions.—Spurious radiation from an amateur station being operated with a carrier frequency below 144 Mc shall be reduced or eliminated in accordance with good engineering practice. This spurious radiation shall not be of sufficient intensity to cause interference in receiving equipment of good engineering design including adequate selectivity characteristics, which is tuned to a frequency or frequencies outside the frequency band of emission normally required for the type of emission being employed by the amateur station. In the case of A-3 emission, the amateur transmitter shall not be modulated to the extent that interfering spurious radiation occurs, and in no case shall the emitted carrier wave be emplitude-modulated in excess of 100 percent. Means shall be employed to insure that the transmitter is not modulated in excess of its modulation capability for proper technical operation. For the purposes of this section a spurious radiation is any radiation from a transmitter which is outside the frequency band of emission normal for the type of transmission employed, including any component whose frequency is an integral multiple or submultiple of the carrier frequency (harmonics and subharmonics), spurious modulation products, key clicks and other transient effects, and parasitic oscillations. When using amplitude modulation on frequencies below 144 Mc, simultaneous frequency modulation is not permitted and when using frequency modulation on frequencies below 144 Mc simultaneous amplitude modulation is not permitted. The frequency of the emitted carrier wave shall be as constant as the state of the art permits.

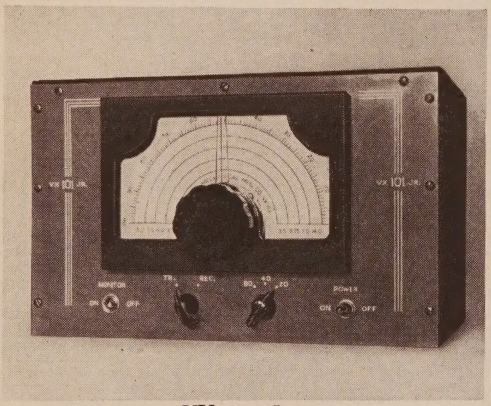
Sec. 12.134 Modulation of carrier wave.—Except for brief tests or adjustments, and except for operation in the band 27.185 to 27.455 Mc, an amateur radiotelephone station shall not emit a carrier wave on frequencies below 144 Mc unless modulated for the purpose of communication.

Sec. 12.135 Frequency measurement and regular check.—The licensee of an amateur station shall provide for measurement of the emitted carrier frequency or frequencies and shall establish procedure for making such measurement regularly. The measurement of the emitted carrier frequency or frequencies shall be made by means independent of the means used to control the radio frequency or frequencies generated by the transmitting apparatus and shall be of sufficient accuracy to assure operation within the amateur frequency band used.

Sec. 12.136 Logs.—Each licensee of an amateur station shall keep an accurate log of station operation, inciuding the following:

(a) The date and time of each transmission. (The date need only be entered once for each day's operation. The expression "time of each transmission" means the time of making a call and need not be repeated during the sequence of communication which immediately follows, however, an entry shall be made in the log when signing off so as to show the period during which communication was carried on.)

(b) The signature of each licensed operator who manipulates the key of a radiotelegraph transmitter or the signature of each licensed operator who operates a transmitter of any other type and the name of any person not holding an amateur operator



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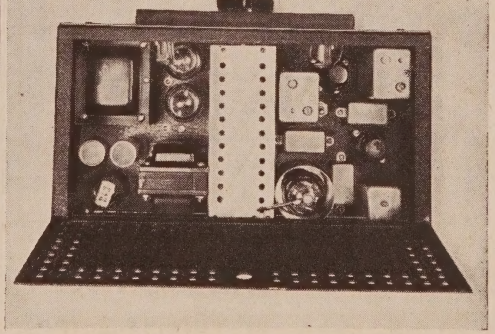
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license who transmits by voice over a radiotelephone transmitter. The signature of the operator need only be entered once in the log, in those cases when all transmission are made by or under the supervision of the signatory operator, provided a statement to that effect also is entered. The signature of any other operator who operated the station shall be entered in the proper space for that operator's transmission.

(c) Call of the station called. (This entry need not be repeated for calls made to the same station during any sequence of communication, provided the time of signing off is given.)

(d) The input power to the oscillator, or to the final amplifier stage where an oscillator-amplifier transmitter is employed. (This need be entered only once, provided the input power is not changed.)

(e) The frequency band used. (This information need be entered only once in the log for all transmission until there is a change in frequency to another amateur band.)

(f) The type of emission used. (This need be entered only once until there is a change in the type of emission.)

(g) The location of the station (or the approximate geographical location of a mobile station) at the time of each transmission. (This need be entered only once provided the location of the station is not changed. However, suitable entry shall be made in the log changing the location. Where operating at other than a fixed location, the type and identity of the vehicle or other mobile unit in which the station is operated shall be shown.)

(h) The message traffic handled. (If record communications are handled in regular message form, a copy of each message sent and received shall be entered in the log or retained on file at the station for at least 1 year.)

Sec. 12.137 Retention of logs.—The log shall be preserved for a period of at least 1 year following the last date of entry. The copies of record communications and station log required by section 12.136 shall be available for inspection by authorized representatives of the Commission.

Special Conditions

Sec. 12.151 Additional conditions to be observed by licensee. —In all respects not specifically covered by these regulations each amateur station shall be operated in accordance with good engineering and good amateur practice.

Sec. 12.152 Restricted operation.—(a) If the operation of an amateur station causes general interference to the reception of transmissions from stations operating in the domestic broadcast service when receivers of good engineering design including adequate selectivity characteristics are used to receive such transmissions and this fact is made known to the amateur station licensee, the amateur station shall not be operated during the hours from 8 o'clock p.m. to 10:30 p.m., local time, and on Sunday for the additional period from 10:30 a.m. until 1 p.m., local time, upon the frequency or frequencies used when the interference is created. (b) In general, such steps as may be necessary to minimize interference to stations operating in other services may be required after investigation by the Commission.

Sec. 12.153 Second notice of same violation.—In every case where an amateur station licensee is cited within a period of twelve consecutive months for the second violation of the provisions of sections 12.111, 12.113, 12.115, 12.116, 12.117, 12.132, or 12.133, the station licensee, if directed to do so by the Commission, shall not operate the station and shall not permit it to be operated from 6 p.m. to 10:30 p.m., local time, until written notice has been received authorizing the resumption of full-time operation. This notice will not be issued until the licensee has reported on the results of tests which he has conducted with at least two other amateur stations at hours other than 6 p.m. to 10:30 p.m., local time. Such tests are to be made for the specific purposes of aiding the licensee in determining whether the emissions of the station are in accordance with the Commission's rules. The licensee shall report to the Commission the observations made by the cooperating amateur licensees in relation to the reported violations. This report shall include a statement as to the corrective measures taken to insure compliance with the rules.

Sec. 12.154 Third notice of same violation.—In every case where an amateur station licensee is cited within a period of twelve consecutive months for the third violation of sections 12.111, 12.113, 12.115, 12.116, 12.117, 12.132 or 12.133, the station licensee if directed by the Commission, shall not operate the station and shall not permit it to be operated from 8 a.m. to 12 midnight, local time, except for the purposes of transmitting a prearranged test to be observed by a monitoring station of the Commission to be designated in each particular case. The station shall not be permitted to resume operation during these hours until the licensee is authorized by the Commission, following the test, to resume full-time operation. The results of the test and the licensee's record shall be considered in determining the advisability of suspending the operator license or revoking the station license, or both.

Sec. 12.155 Answers to notices of violations.—Under title III of the act.—Any licensee receiving official notice of a violation of the terms of the Communications Act of 1934, any legislative

act, Executive order, treaty to which the United States is a party, or the Rules and Regulations of the Federal Communications Commission, shall, within 3 days from such receipt, send a written answer direct to the Federal Communications Commission at Washington, D. C., and a copy thereof to the office of the Commission originating the official notice when the originating office is other than the office of the Commission in Washington, D. C.: Provided, however, that if an answer cannot be sent nor an acknowledgment made within such 3-day period by reason of illness or other unavoidable circumstances, acknowledgment and answer shall be made at the earliest practicable date with a satisfactory explanation of the delay. The answer to each notice shall be complete in itself and shall not be abbreviated by reference to other communications or answers to other notices. If the notice relates to some violation that may be due to the physical or electrical characteristics of transmitting apparatus, the answer shall state fully what steps, if any, are taken to prevent future violations, and if any new apparatus is to be installed, the date such apparatus was ordered, the name of the manufacturer, and promised date of delivery. If the notice of violations relates to some lack of attention or improper operation of the transmitter, the name of the operator in charge shall be given.

Sec. 12.156 Operation in emergencies.—In the event of widespread emergency conditions affecting domestic communication facilities, the Commission may confer with representatives of the amateur service and others, and if deemed advisable, declare that a state of general communications emergency exists, designating the area or areas concerned (normally not exceeding 1,000 miles from center of the affected area), whereupon it shall be incumbent upon each amateur station in such area or areas to observe the following restrictions for the duration of such emergency.

(a) Transmissions, other than those relating to relief work or other emergency service, such as amateur station networks can provide, shall not be made within the 1750-2050 kc or 3500-4000 kc bands. Incidental calling, testing and working, including casual conversation or remarks not pertinent or necessary to constructive handling of the emergency situation shall be prohibited.

(b) Frequencies within the bands 2025-2050 kc, 3500-3525 kc and 3975-4000 kc shall be reserved for emergency calling channels, for initial calls from isolated stations or first calls concerning very important emergency relief matters or arrangements. All stations having occasion to use such channels shall change, as quickly as possible, to other frequencies for carrying on their communications.

(c) A 5-minute listening period for the first 5 minutes of each hour shall be uniformly observed for initial calls of major importance, both in the designated emergency calling channels and throughout the 1750-2050 kc and 3500-4000 kc bands. Only stations isolated or engaged in handling official traffic of the highest priority may continue with transmissions in these listening periods. No replies to calls or resumption of routine traffic shall be made in the 5-minute listening periods.

(d) The Commission may designate certain amateur stations to assist in promulgation of its emergency announcement, to police the 1750-2050 kc and 3500-4000 kc bands and to warn non-complying stations observed to be operating therein. The operators of these observing stations shall report fully to the Commission the identity of any stations failing to comply, after notice, with any of the pertinent provisions of this section. Such designated stations will act in an advisory capacity when able to provide information on emergency circuits. Their policing authority shall be limited to the transmission of information from responsible official sources, and full reports of non-compliance which may serve as a basis for investigation and action under section 502 of the Communications Act. Such policing authority shall apply only to the 1750-2050 kc and 3500-4000 kc bands. Individual policing transmissions shall refer to this section of the rules by number (12.156) and shall specify briefly and concisely the date of the Commission's declaration and the area and nature of the emergency. Policing observer stations shall not enter into discussions with other stations beyond the furnishing of essential facts relative to the emergency.

(e) The special conditions imposed under this section will cease to apply only after the Commission shall have declared such emergency to be terminated.

Sec. 12.157 Obscenity, indecency, profanity.—No licensed radio operator or other person shall transmit communications containing obscene, indecent, or profane words, language, or meaning.

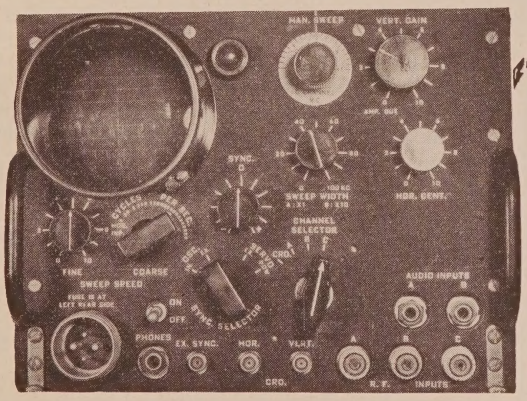
Sec. 12.158 False signals.—No licensed radio operator shall transmit false or deceptive signals or communications by radio or any call letter or signal which has not been assigned by proper authority to the radio station he is operating.

Sec. 12.159 Unidentified communications.—No licensed radio operator shall transmit unidentified radio communications or signals.

Sec. 12.160 Interference.—No licensed radio operator shall willfully or maliciously interfere with or cause interference to any radio communication or signal.

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Sec. 12.161 Damage to apparatus.—No licensed radio operator shall willfully damage, or cause or permit to be damaged, any radio apparatus or installation in any licensed radio station.

Sec. 12.162 Fraudulent licenses.—No licensed radio operator or other person shall obtain or attempt to obtain, or assist another to obtain or attempt to obtain, an operator license by fraudulent means.

[*Appendix will appear in July CQ*]

DISTORTION

[*from page 17*]

crease in modulation of about 6 db over what it was with all the stages out of phase.

The easiest way to check the system is by use of an oscilloscope. If an oscilloscope is not available, the circuit of *Fig. 4* can be used. To set up the circuit of *Fig. 4*, the voltage is removed from the modulation transformer and the cathode of the rectifier grounded. With voltage applied to the potentiometer, the potentiometer is set so the neon globe barely lights. The ground is removed from the cathode and the voltage reapplied to the modulation transformer. When a negative peak causes the plate voltage to drop to zero the neon globe will flash, so this provides a means of monitoring negative peaks.

In checking the system to take advantage of your distortion, a dummy load should be put on the transmitter, and the indicating device watched for occurrence of negative peaks, if an oscilloscope is used it is possible to observe the positive peaks at the same time and it may be seen that they are down in amplitude from the negative peaks. If a phase inverter is used in the speech equipment, the first check will be to phase it. This is done by whistling a pure note, or using an audio oscillator, and measuring the relative peaks with sine wave input. The connection to the modulator plates or the r-f connections may be reversed to extend the positive peaks. With the phase inverter phased, the microphone and first speech stage should be checked by reversing the polarity of the microphone. If the microphone is built so that the leads cannot be reversed, it is suggested that the output of the first speech stage be used to drive the other side of the phase inverter. If this is done, the modulator output connections will need to be reversed again to keep the phase right.

In all it should take very little time to phase all the second harmonic distortion present so that it may be least objectionable. It gave the author a pleasant thrill to be complimented by several DX stations on the clearness and crispness of quality while the carrier was well modulated, and to know that at the same time the fellow just down the street was copying DX on an adjacent channel, without hearing any side band splatter. If you have distortion at least let it work for you.

CRYSTAL DIODES

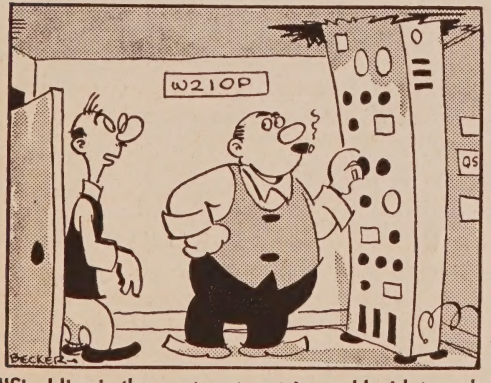
[*from page 16*]

of the crystal mixer stage is less than one, a high signal-to-noise ratio can be obtained in the conversion to the i-f frequency, and with correct design the "Q" of the resonant cavity itself (or that of the equivalent circuit shown in *Fig. 2b*) will approximate 25,000. If the i-f frequency is selected to be about 30 mc a good communications receiver will satisfactorily perform, providing necessary i-f amplifiers as well as the second detector and audio circuits.

Other Uses

A great deal of published information is now available to the amateur desirous of further data on super-high-frequency receivers and applications of the resonant cavity. In view of the simplicity of these devices and the high conversion efficiencies obtained in conjunction with diode mixers, it is recommended that crystal mixer superheterodynes be investigated by those with a yen for some experimentation with the super-highs.

So varied are the applications for which crystal diodes are ideal that it becomes difficult to mention but a few. The conventional vacuum tube absorption frequency meter, for example, can be considerably lightened by eliminating the tube and its filament battery supply in favor of a crystal diode rectifier. *Fig. 3* depicts a simple 144 mc frequency meter circuit using a 1N34 crystal diode. The unit can be constructed to be only slightly larger than the 0-1 milliammeter being used. In fact, whenever space and filament power are to be conserved and whenever simplicity of construction is desirable, the amateur will find the new crystal diodes to be most satisfactory and well worth a try.



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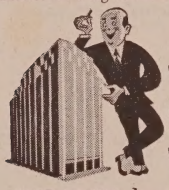

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