CQ

APRIL, 1948

The Radio Amateurs' Journal

35¢

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

FOR AMATEURS

WITH PROFESSIONAL TASTES

N
W — RME — E
S

The New DB22A *Preselector*

Coverage .54 to 44 Mc. — Average Gain 30 DB

Here's the new DB22A completely redesigned for greater efficiency and higher signal to noise ratio. It uses new 6BA6 miniatures. Image ratio is better than 50 DB with a communications receiver having a single stage of RF. It's calibrated, has smooth planetary tuning, self contained power supply, antenna bypass switch, gain control and many other features. Connect the DB22A to your receiver just like an antenna — no wiring — no plug in coils. It's entirely self-contained — entirely in a class by itself!

The RME 84

For Home, Portable or Mobile Operation

A quality receiver in the lower price field that will give you the most for your money. Operates from 115 volts AC, batteries or from the VP-2, a six volt power pack, optional with the RME 84. Also optional, and illustrated, is the CM-1 — Carrier Level "S" Meter.

The VHF-152 *Converter*

For Two, Six, Ten and Eleven Meters

At a cost that an amateur can afford — the new VHF-152 used with a communications receiver will give you peak performance on the very high frequency bands, utilizing an efficient double conversion system. Unit has built in power supply, voltage regulator and temperature stabilized oscillator circuits. Provision is made for connection of 4 separate antennas.

Illustrated Folders On Request

TIME WILL TELL

RME

FINE COMMUNICATIONS EQUIPMENT

RADIO MFG. ENGINEERS, INC.

Peoria 6, Illinois U. S. A.

BULLSEYES THE TARGET

. . . in usefulness to the ham

. . . in value-for-money

A GRAND tube, the GL-810, with performance that's ideal for the ham using medium to high power! One tube will take 750 w maximum input CW, or 500 w phone. Double these figures for push-pull.

Coverage? All the DX bands from 80 down to 10 meters, at top input. At reduced input add the 6-meter band. Specifically, the tube will operate up to 30 mc at full ratings, or 100 mc at lower ratings.

To well-rounded performance, to compact modern design with short internal leads, add a bulldog ability to "take it". The tube's heavy-duty filament—shielded at both ends to conserve power—has reserve capacity in case of overloading. From cap-terminal down to base, the GL-810 is strongly built, *G-E-built,* for service you can bank on. Put a pair of these stalwarts in your final, and you're "set" for long hours of steady activity with key or mike.

Best of all . . . the tube is economical to buy! Type GL-810 is a watts-per-dollar bargain ranking high among values offered the ham. Check the low price today with your nearby G-E tube distributor. *Electronics Department, General Electric Company, Schenectady 5, New York.*

GL-810 POWER TRIODE

RATINGS, 2 TUBES

Typical Class C Operation (ICAS)

	CW	Phone
Plate voltage	2,500 v	2,000 v
current	600 ma	500 ma
Grid current (approx)	120 ma	140 ma
Driving power (approx)	38 w	70 w
Power output (approx)	1,150 w	760 w

● See your G-E tube distributor for a copy of each bi-monthly issue of "Ham News". Stay posted on what's new, practical, and helpful in amateur work!

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

GENERAL ELECTRIC

161-GA4-8850

COMPARE THE QUALITY

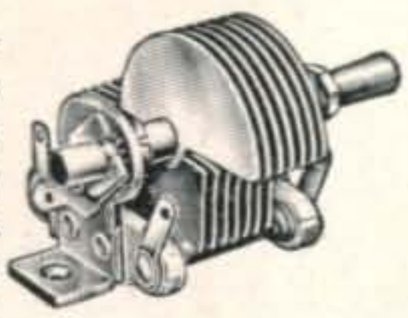
COMPARE THE PRICE

Of any of the items listed in this ad and for further comparison write for the NEW BUD CATALOG NO. 148.

Deliveries of all BUD items now greatly improved. Your jobber should be able to supply you with almost any BUD item from stock.

VARIABLE CONDENSERS

BUD makes 248 different sizes and types of condensers. We list here the most widely used condensers, known as the BUD MIDGET, for your comparison.



15 mmfd. —	**$1.14**	140 mmfd. —	**1.80**
33 mmfd. —	**1.22**	190 mmfd. —	**1.95**
50 mmfd. —	**1.45**	235 mmfd. —	**2.18**
100 mmfd. —	**1.62**	300 mmfd. —	**2.40**

For prices on other sizes and types, see NEW BUD CATALOG. Ask your jobber for one.

NEW CODE PRACTICE OSCILLATOR AND MONITOR

This is a dual purpose money saver. Use it as a code practice oscillator until you get your ticket, and then as a good C. W. Monitor.

Yours for only **$12.50** in the speaker model and **$10.15** in the earphone model.

BUD GIMIX — The handiest instrument in your shack. Use it as a WAVE METER. Use it as a MONITOR. Use it as a Field Strength Indicator. Use it as a CARRIER SHIFT INDICATOR. Use it as a sensitive NEUTRALIZING instrument. BUY IT AT YOUR DISTRIBUTOR TODAY.

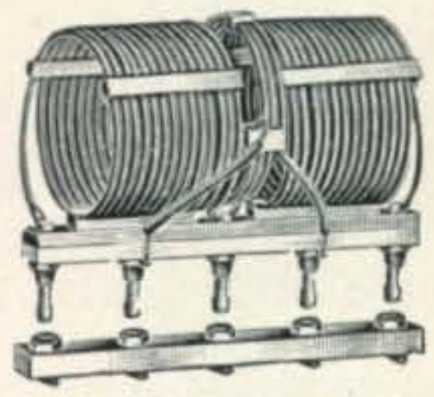
Dealer Net $8.30

BUD ADJUSTABLE LINK TRANSMITTING COILS

Same price with either center or end link

500 watt rating

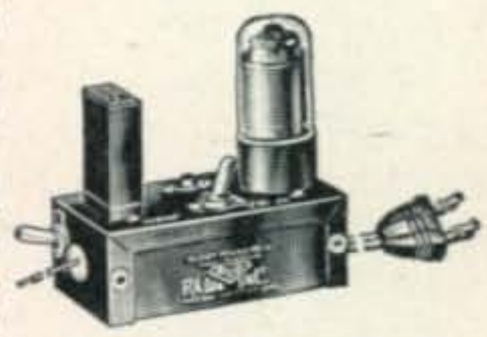
80 meter —	**$3.65**
40 meter —	**3.30**
20 meter —	**3.00**
15 meter —	**2.97**
10 meter —	**2.88**
6 meter —	**2.64**



FOR OTHER SIZES AND TYPES OF COILS SEE THE NEW BUD CATALOG

BUD FREQUENCY CALIBRATOR

No shack should be without a means of accurately checking transmitter frequency The BUD FCC-90 s a 100 kc crystal oscillator that is COMPLETELY SELF-POWERED. No extra wiring is needed and you don't have to touch the inside of your receiver. Your distributor has it in stock. Your cost only **$14.25.**



No longer do you have to take substitutes. Your distributor can supply you with most BUD chassis and other sheet metal items directly from his stock. Accept no substitutes. Get the highest quality at the lowest price. Best buy is BUD.

WRITE FOR BUD CATALOG 148

The mark BUD *of perfection*

BUD RADIO, INC.

2120 EAST 55TH ST.,

CLEVELAND 3, OHIO

CQ

The Radio Amateurs' Journal

Published monthly by RADIO MAGAZINES, INC., at 342 Madison Ave., New York 17, N. Y. Telephone: MUrray Hill 2-1346. Entered as Second Class Matter at the Post Office, Springfield, Mass. under the Act of March 3, 1879.

Vol. 4 **APRIL, 1948** **No. 4**

In This Issue

COVER—The T9'er, a deluxe v.f.o. which includes a keying monitor and receiver blocking circuit.

Letters 6

Scratchi 10

Zero Bias (Editorial) 13

The T9'er
Eugene Black, Jr., W2ESO 17

Superconductive Detector 22

An Ionosphere Storm Indicator
J. F. McCutchan, WØHXY 23

So I Bought a 348-Q
James H. Owens, W2FTW 25

Emergency Capacitor 28

Inside the Shack and Workshop 29

The Radio Amateur Newcomer—Radio Frequency Power Amplifiers. *H. A. Bowman, W6QIR, & W. A. Goddard, W6AKQ* 30

A Shunt-Fed 1-kw Final
R. P. Turner, W1AY 34

The Beer Can Vertical
Clifford Paterno, W2PPT 37

Direction Indicator for the Prop Pitch-Change Mechanism
George M. Brown, W2CVV 38

Old-Timers Organize 39

Notes on the Angle of Radiation
Oliver P. Ferrell 40

Heaven for Hams
Pat Miller, W2AIS 44

Directionals
Clayton F. Bane, W6WB 46

The New Look—Millen, Stancor, Temco 48

Monthly DX Predictions—April 50

DX and Overseas News 52

W.A.Z. Honor Roll 53

V.H.F.—U.H.F. 54

50-mc Honor Roll 56

The YL's Frequency 58

Parts and Products 60

Revised Official Country List 74

This QSL Situation
Henry W. Yahnel, W2SN 78

Advertising Index 112

Make your RADIO a WIRE RECORDER COMBINATION

easy to install WEBSTER-CHICAGO *Wire Recorder*

FOUNDATION UNIT

LIST $75.00

Designed for Amateurs... Experimenters... Professionals!

Complete with new, improved Webster-Chicago circuit for easy connection to existing amplifier circuits. Supplied with oscillator coil, 15-minute spool of recording wire and construction manual. Hook it up yourself to record radio programs . . . shortwave broadcasts . . . messages . . . speed checks. Records and plays up to a full hour. Small, compact size: 10½x8¾x5½ inches. Net weight 10 lbs.

See Your Ham Supply House

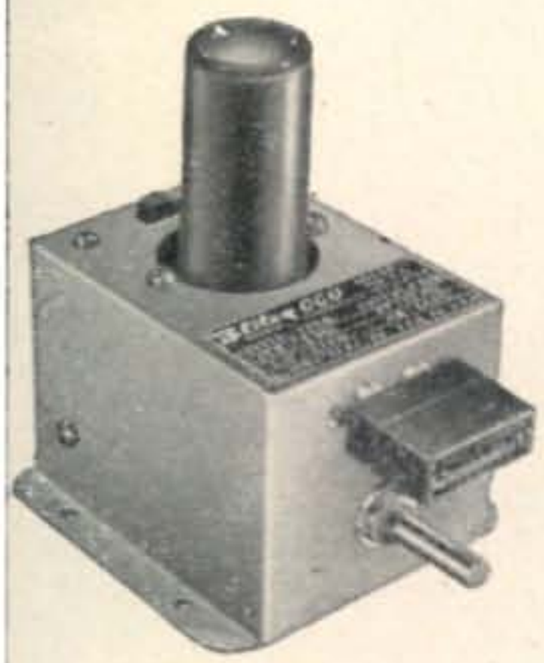
Made by the Makers of **WEBSTER-CHICAGO**
Record Changers and Nylon Phonograph Needles

WEBSTER-CHICAGO

5610 BLOOMINGDALE AVENUE • CHICAGO 39, ILLINOIS

Bliley

CRYSTALS AND CRYSTAL CONTROLLED OSCILLATORS



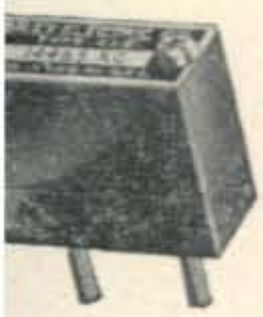
CCO — CRYSTAL CONTROLLED OSCILLATOR — MODEL 2A

For 2-6-10-11 Meters

With this basic oscillator, employing a 6AG7 tube, the advantages of VHF crystal control are easily achieved. Has direct output on 6-10-11 meters and ample output to drive tripler stage on 2 meters. Single tuning control, bandswitch and crystal socket are mounted on outside of painted metal subchassis with power and output terminals at back. Uses Bliley AX2 20-meter crystals for output on 10 and 11 meters, new Bliley AX3 crystals for 6 and 2 meter operation. Ideal as nucleus for new construction or conversion of existing equipment.

Supplied less tube and crystal **$9.95**

AMATEUR FREQUENCY CRYSTALS



TYPE AX2

These high stability advanced design crystals are plated to insure long term precision and reliability. Calibrated to ±.002% with drift less than .0002% per degree Centigrade. Holder pins spaced on .486" centers.

Supplied	Range	Price
± 2 Kc	3500— 4000 Kc	$2.80
± 2 Kc	7000— 7425 Kc	2.80
±30 Kc	12500—13500 Kc	3.95
±30 Kc	13580—13714 Kc	3.95
±30 Kc	14000—14850 Kc	3.95

TYPE AX3

A new third overtone crystal unit produced for use in the Bliley CCO-2A. Has exceptionally high activity at operating frequency. Calibration accurate to ±.003% in CCO-2A with drift less than .0002% per degree Centigrade. Plated crystal is mounted in gasket sealed holder with pins spaced .486" centers.

Supplied	Range	Price
±5 Kc	24000—24333 Kc	$3.95
±5 Kc	25000—25500 Kc	3.95

TYPE CF6 455 Kc

Single signal filter crystal unit. Exceptionally low holder capacity permits sharp signal discrimination in filter network of general communications receivers. Frequency 455 Kc free from spurious responses within ±7 Kc.

Price **$4.50**

TYPE CF3 455 Kc

Single signal filter crystal unit. Frequency 455 Kc, ±5 Kc—free from spurious responses within ±7 Kc of fundamental. Designed for intermediate frequency filter in general communications receivers.

Price **$5.00**

TYPE MC9 3105 Kc

This unit is suggested for use in private aircraft transmitters operating at 3105 Kc. The crystal is guaranteed to be within ±.02% of 3105 Kc at any temperature between O° C and 50° C and is factory tested for performance over this temperature range. Plug-in type holder is gasket sealed against moisture and humidity.

Price **$5.50**

TYPE VX2 3105 Kc

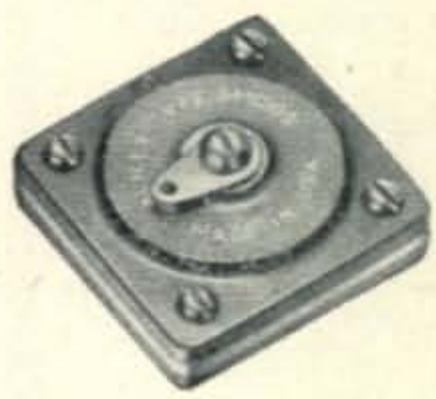
Designed for applications where space is at a premium, this unit is recommended for private aircraft communication at 3105 Kc. Guaranteed to maintain frequency within ±.02% at any temperature between O° C and 50° C. Solder lug connections permit mounting under chassis and assembly is gasket sealed against moisture and humidity.

Price **$5.00**

TYPE KV3 100 Kc

A precision crystal designed for use in secondary standards. Crystal is silver plated and mounted between wire supports which are soldered to the plated surfaces. Exceptionally low drift crystal is adjustable to exactly 100 Kc at 25° C when used in recommended oscillator circuit.

Price **$6.95**



TYPE SMC100 100-1000 Kc

Dual frequency crystal provides either 100 Kc or 1000 Kc frequency source. When used in recommended oscillator circuit 1000 Kc frequency is within ±.05% at 25° C and 100 Kc frequency can be adjusted to zero beat at 25° C. Suggested for signal generators used in alignment of radio receivers.

Price $8.75

For complete dimensional information consult Bulletin 35 available at any Bliley distributor.

Bliley CCO CRYSTAL CONTROLLED OSCILLATOR

MODEL 1C

For instant channel selection and frequency accuracy, radio service technicians use this Bliley test instrument. It provides direct crystal control for i-f alignment. Write for descriptive Bulletin 32.

Complete with 7 Bliley crystals, tubes and concentric output cable..... **$69.50**

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA

★ ★ ★ Letters ★ ★ ★

Aid for Amateurs in Need

59 Orland Rd., Rochester 9, N. Y.

Editor, *CQ:*

When I received the following letter I was a bit apprehensive at first since I never knew Steiner; I imagine he got my name from a *Call Book*. I talked with a friend who had been with UNRRA in Germany, and she told me that the best thing I could do was to send him a C.A.R.E. package, and also to inform him of the best way to obtain relief, which for displaced persons is through the religious agency, C.R.A.L.O.G. (Council for Relief Agencies Licensed for Operation in Germany). His succeeding letters have convinced me that his case is genuine (for some are not) and that he certainly deserves anything I can do.

Possibly you may know of others who would like to help a fellow ham. His case is not unlike others, except that he is in the situation of not being able to return to his own country, and at the same time unable to receive regular relief since he is a former enemy. I expect that others have received similar letters, but I have heard of only one in town, that being from a German ham to W2UPH, our former SCM.

R. G. Talpey, W2PUD

Muhlacker, Krs-Vaihingen-Enz. Schillerstrasse 60,
U.S. Zone, Germany

Dear OM, W2PUD:

I beg to be excused for the trouble I am causing you with my letter, but I am writing you as a ham from Hungary, HA7T. It has been almost 25 years since I was first licensed as a ham. I made many friends and had a good many interesting experiences in amateur radio.

My transmitter was a home-built m.o.p.a. running 35 watts input. I used Zepp and Fuchs antennas. My receiver was a home-built S-VS-P. I worked on the 20, 40 and 80 meter bands. Except for Australia, I worked all continents on 20 meters.

It was the war, I am sorry to say, which destroyed my existence and pushed me into misery. I was an analytical chemist at the Chemical Institute of Sopran, Hungary; now I am practically a beggar.

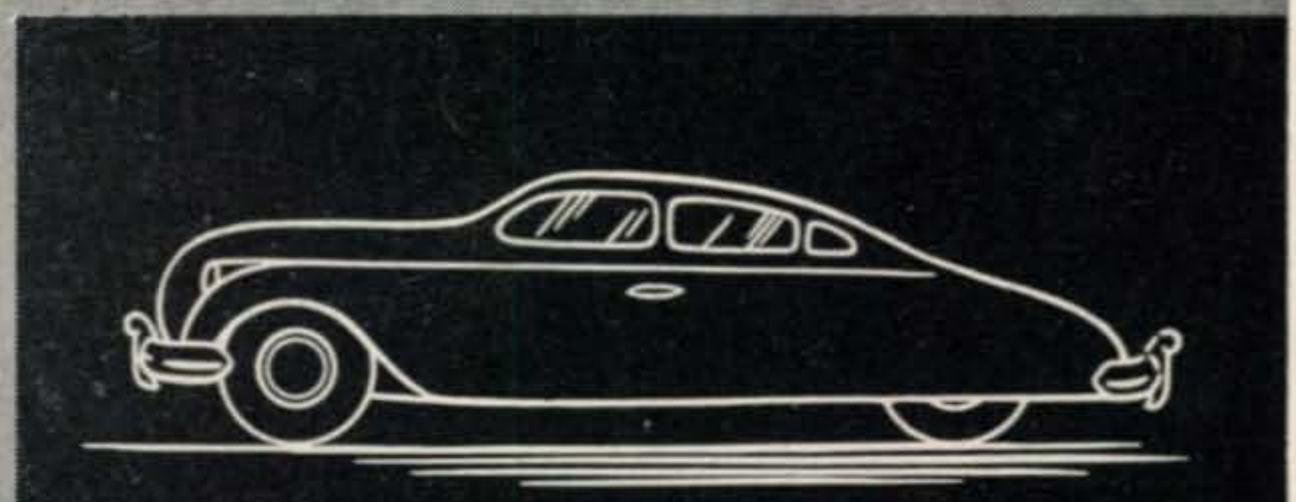
I am one of the numerous sacrifices of the terrible Nazi terror, which raged in Hungary, too. I was dismissed, they took away my fortune so I lost my house, grounds, private laboratory and all my property. Then I was forced to leave all who were dear to me and as a beggar I was abducted with my sister from my home in Hungary and taken to Germany.

It would be too long to describe fully our suffering, need and misery. . . . The food situation is very grave. We foreign people are here only like coolies of the Germans and have to work very hard for our livelihood. There is nobody who helps us.

You cannot imagine what we are feeling in this strange land where we have no friends, no help. Far from our country, far from all that we loved, we must stay here among the hostile-minded German people who are still so very Nazi minded. They are glad when they can harm us, and if the Americans should not protect us we would perish.

At present it is not possible to return to our home in Hungary for it is not sure there . . . I would be luckiest if *I* could obtain work as an analytical chemist in a foreign country.

In this awkward predicament I take the liberty of appealing to you, OM. If you could help me a little



MODERN DESIGN IS COMPACT!

Ken-Rad miniature tubes—compact—do all their larger counterparts will do, while conserving needed space.

NO NEED to jam-pack every cubic inch of chassis area... not with Ken-Rad miniatures available! *Now* you can add new circuit features to your rig without overcrowding or loss of accessibility.

Front and center for the nine-pin 12AU7, newest big-league performer in Ken-Rad's line! Lots of tube here in small compass; for this husky midget, with a filament taking either 6.3 or 12.6 volts, does the full job *plus* of a 6SN7-GT or 12SN7-GT!

Use the twin-triode 12AU7 as two audio-amplifier stages, self-contained—or with one unit functioning as an audio-amplifier, and the other as a phase inverter. Other applications will develop as you become familiar with this tube, since structurally it is the equivalent of two 6C4's.

Lead inductance, of course, is low. That's because (1) the internal leads of the 12AU7 are short due to ultra-compact tube design, and (2) the tube, like all miniatures, has no base, therefore external lead inductance is reduced.

Your Ken-Rad distributor or dealer will be happy to show you the 12AU7, as well as other tubes in the extensive Ken-Rad miniature group. See him today!

KEN-RAD

12 A U 7
NINE-PIN MINIATURE

TYPICAL OPERATION
CLASS A_1 AMPLIFIER
(each triode section)

Plate voltage	250 v
current	10.5 ma
Amplification factor	17
Transconductance	2,200 micromhos

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

176-GA4-6850

Make the nearest Ken-Rad distributor or dealer your preferred source for amateur tubes

I should be very much obliged to you. If you would be so kind to send me some food; we are so very short of food. If there is anything that I can do for you, I shall take the greatest pleasure in doing anything to oblige you.

Gustav Steiner, HA7T

Keep the Class A License

RFD 4, Mount Vernon, Wash.

Editor, *CQ:*

It is heartening to note how seriously amateurs are becoming concerned about the rules and regulations in force today. Much present day discussion is centered around the Class A ticket. I believe the Class A should be retained. If anything be done about it, the technical examination could stand a little stiffening, and I believe it would be a good idea that code proficiency should be a prerequisite. Many "died in the wool" phone men say they could work c.w. if the need be urgent, but could they? Maybe around 5 to 10 wpm. That would be a lot of help in an emergency. I don't think any amateur radio operator worthy of the name should think he needn't concern himself with his c-w operating ability.

It has been suggested that "B" men shouldn't be allowed phone operation until they have had some actual c-w operating experience for, say, six months. This may sound drastic, but I believe it would be a benefit to amateur radio in the long run by giving the experience which someday might prove invaluable and letting potential "phone only" fellows find c.w. a lot of fun.

Under the present outdated phone and c-w allocations our bands are being used to capacity (at times) but they aren't being utilized to capacity, and utilize them we must if we want to stand a chance of keeping them, and also offer our swelling ranks a chance to use the domestic bands to better advantage especially for ever increasing phone. Let us start with 10 meters—250 kc of that band is sufficient for both c.w. and DX phone. We need that "idle" 250 kc for our own use badly enough. This wouldn't be partial to phone because 95% of 10 meter c.w. is confined to the lower 100 kc of the band.

On 20 meters, phone and c.w. are equally popular, but phone has only 100 kc. The upper portion of the band could best be used by phone, as it is now, but comparatively little c.w. is using it.

Forty is a delicate subject. Traditionally a c-w band, forty meters is continually sought after by phone. Evening congestion by c.w. alone is so terrific that phone is out of the question. However, during the day there is a dearth of amateur signals, particularly in the upper limits where commercials of one kind or another reign. This situation should be corrected. Of course, we can't stop the commercials, but we can open it to phone during certain hours—12 midnight to 3:00 p. m. PST would be a good time. This would also ease the burden on 20 and 10. This plan is only a compromise, of course.

On 80 meters c.w. hardly knows real QRM compared to phone, except for a couple of hours at most. Phone should be granted their share. Here again we have a band too quiet during off hours. Class B operators have long been clamoring for a low-frequency phone band. Well, why not give them one? After their aforementioned period of strictly c.w., let them operate phone in the lower 100 to 125 kc of 80 meters, if and only if the maximum input be 25 watts or less. The power limitation is absolutely necessary from a QRM standpoint alone, and will also allow the newcomer to

(*Continued on page 102*)

MAKING TUBES IS EASY..

If YOU KNOW HOW!

MEASURABLE CHARACTERISTICS CURVES IN 15 SECONDS INCLUDING BOTH POSITIVE AND NEGATIVE GRID REGIONS

Watch the operator manipulate quickly the switches and knobs of this new Hytron electronic curve tracer. Like magic, graduated horizontal and vertical scales flash onto the screen, and he calibrates them in desired units by adjusting the marker pips. Effortlessly, he traces the three basic characteristics curves (E_b-I_b, E_b-I_{c1}, E_b-I_{c2})—for a quick check or a photographic record. No slow tabulating and plotting of dozens of meter readings.

Because the grid potential is applied in a momentary, narrow pulse (monitored by the smaller 'scope), the curves include the positive grid region so important in analyzing transmitting tubes. Another advantage, missed with roughly plotted curves, is that the slightest eccentricities in the curves are apparent. Improper tube geometry, for example, is immediately detectable.

A maze of trigger, phase-inverter, and sweep circuits, synchronizing pulse generators, electronic switches, and regulated power supplies—the curve tracer's principle of operation is simple. Microsecond pulsing, electronic switching, and persistency of the oscilloscope screen do the trick. What does this fancy gadget mean to you? Better, more uniform Hytron tubes, because design and production control are easier, better. The new Hytron curve tracer is another step forward to give you the best in tubes.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

Dead Man's Gulch, Ariz.

Deer Hon. Ed.

As you are seeing from above Scratchi is in trubble and he are afraid that another dead man's are going to be in this gulch soon. Brother Itchi are sneaking out and he are saying that a posse are looking for me. If you are familiar with Ariz. custom you are knowing that the posse is wanting to having a necktie party.

This predickament are being caused when I are putting my xmitter on air while using raleroad tracks and telefone lines as an antenna. As I wrote you recently this sistem are reely working, and I are having QSO's with practikally all the states and even Canada. In fack, Scratchi are so sure that idea is super S-9 plus that he are writing patented attorney to see about getting patent. I are not heering from attorney but WHOOSH!! Scratchi are surely heering from other peeples.

I knowing I as dopey as a eighty meter coil wound on poly but dumb me are using old call I used to having. So when the fireworks started it only took a cupple of days for peeple to find outs who is causing there trubbles. Scratchi are first finding that all was not p.d.c. when fancy limoseen drives up to Itchi's ranch and big-shots from raleroad are looking for me. Luckily I are not in, but he are telling Itchi that for the past three days terribul things happening on raleroads.

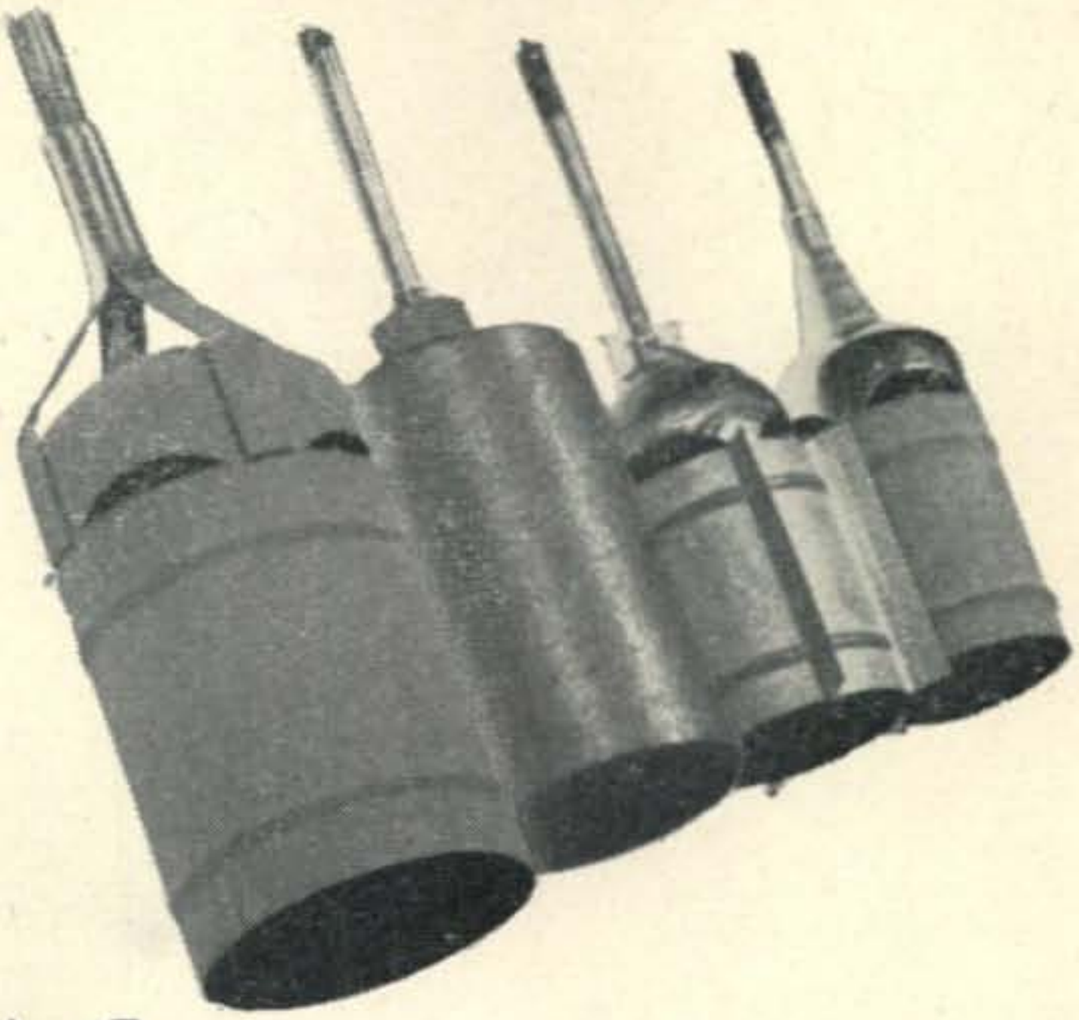
The block signals are not working for sum reason, and trains are all mixed up. Also, peeples trying to sleep in Pullman cars are annoyed because there lights won't go out, but keep blinking on and off. Hee-hee, Hon. Ed., I are even getting SWL card from feller on sleeper near St. Louis. He are saying that I are keeping him awake most of nite but he are enjoying listening to my QSO. What with trains all off skedule and peeple not wanting to take sleepers, raleroad magnet are naturally upset. He are leaving and telling Itchi he are sending sheriff after me.

I are taking hints and leeving ranch reel quicklike. Itchi are keeping me posted. The telefone company is having trubbles also. It seems repeeter tubes in audio sistems are not liking r.f. and are blowing out like fury all over countries. While telefone companies working like mad to keep long distance lines open they are discovering that strange disturbance are coming on all network programs. This are naturally arousing their curiosity and they are adding up two by twos and quickly coming to obvious conklusion. They are trying to get trubbles off networks and finding it coming from out west. Of course, Scratchi are pouring in several kilowhats into line (through blocking condenser of course) so it are not taking any magician to tracking down source of trubbles.

Telefone peeple are trying to confiskate Scratchi's xmitter, but raleroad lawyers are trying to confiskate

(Continued on page 109)

there IS a difference.



PYROVAC the new Eimac plate material makes a better vacuum tube anode . . . on all counts.

1 LIFE . . . Tubes with tantalum plates formerly giving 3000 hours of service, now, with Pyrovac plates operate in excess of 15,000 hours . . . a 400 percent increase.

2 OVERLOADS . . . With Pyrovac plate, 65 watt tubes have dissipated 900 watts—a 1280 percent momentary overload—without indication that the eventual life of the tubes or their characteristics were affected. In normal service these tubes are still going strong. Excessive plate dissipation due to tuning procedure and circuit failure normally won't mean the loss of your tube.

3 MECHANICAL CHARACTERISTICS . . . Pyrovac is easily welded, enabling rugged shock-resistant mounting. It is a "black body" radiator and possesses excellent characteristics as an electrical conductor.

4 COSTS . . . Pyrovac plates in Eimac tubes cost you no more, yet since they enable longer life you actually get more for your vacuum-tube-dollar.

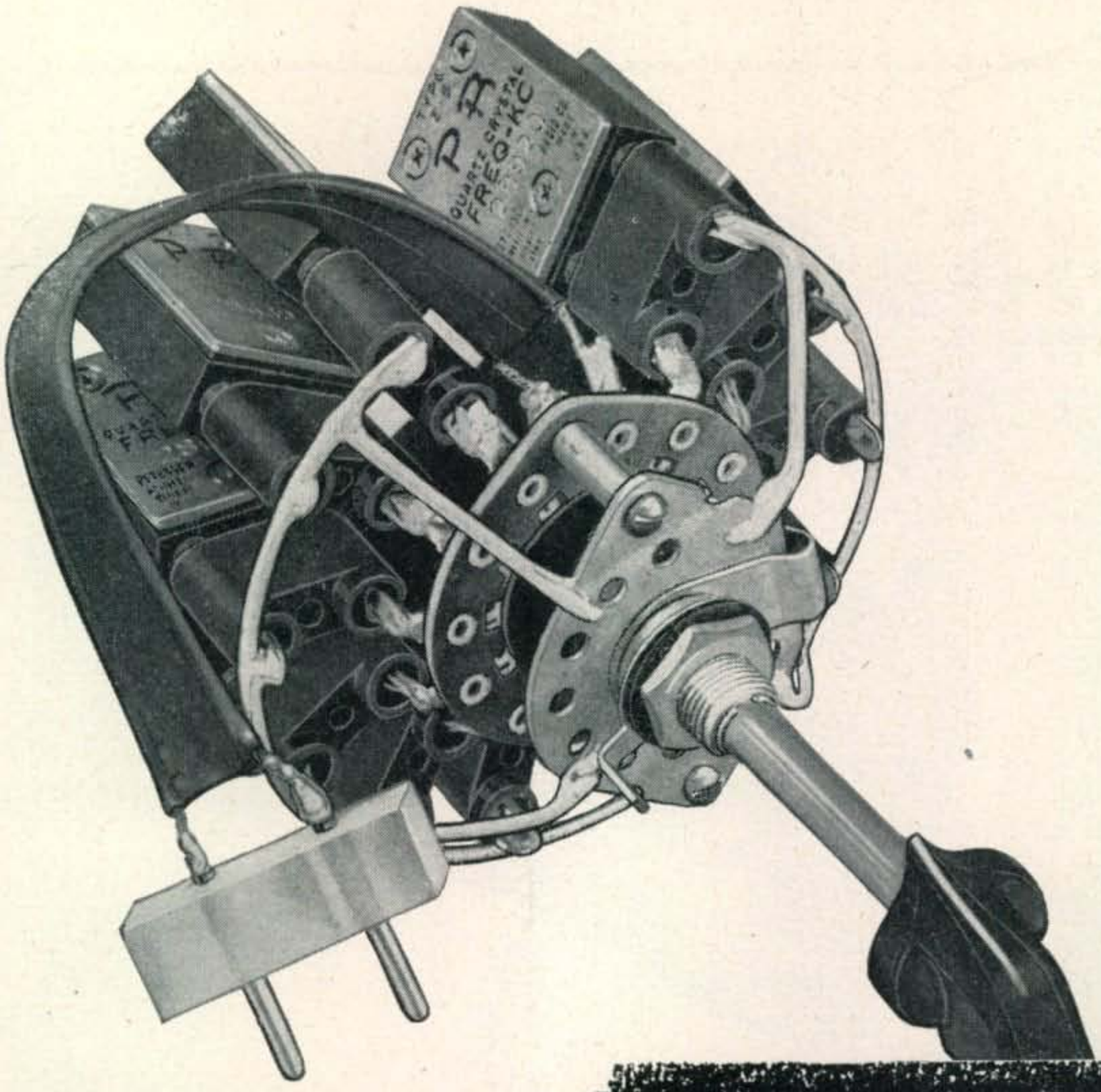
5 PROVEN IN SERVICE . . . Pyrovac is the result of millions of hours of life tests. The universal acceptance of the 4-125A and the 4-250A in all fields of electronic endeavor can, in part, be attributed to Pyrovac for contributing overload resistance, life, and a general ability to "take it."

THESE ARE THE TUBES WITH PYROVAC PLATES

EIMAC TUBE TYPES	PLATE DISSIPATION watts
TETRODES	
4-65A	65
4-125A	125
4-250A	250
4-400A	400
4-1000A	1000
TRIODES	
25T	25
3C24	25
35T	50
35TG	50
75TH	75
75TL	75
100TH	100
100TL	100
152TH	150
152TL	150
250TH	250
250TL	250
304TH	300
304TL	300
450TH	450
450TL	450
750TL	750
1000T	1000
1500T	1500
2000T	2000

EITEL-McCULLOUGH, Inc.
193 San Mateo Ave., San Bruno, California

Export Agents: Frazar & Hansen 301 Clay St., San Francisco, Calif.



NOW YOU CAN GO PLACES!

QSY is as easy as pie! Yes, the Crystal Shifter illustrated above gives you INSTANT SELECTION of as many as eleven crystal controlled frequencies within a 100 kc. or so range on phone . . . without removing excitation, turning off plate current, or retuning of transmitter stages . . . without danger of getting out of the band . . . with positive knowledge of where you are ALL THE TIME! You can build this PR Crystal Shifter in a half hour or less with a soldering iron and a pair of pliers. You can follow the construction easily from the above photo. Components needed are: Centralab 11 position rotary switch assembly No. 1402; eleven (or less) Cinch No. 9827 single crystal sockets; a length of No. 12 tinned copper wire; a Mosely 75-5 adaptor plug; a piece of 300-ohm Twinlead; and a group of PR Precision Crystals. Use PRs you now have and add more frequencies as you want to. Mount the completed assembly on the front panel, plug into your crystal socket and you're ready to flit from frequency to frequency at will! It occupies less than 3½ inches of panel space. Many 10 meter phone men are already using the Crystal Shifter. Make it! Try it! — Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Ia.

SINCE 1934

PR Precision CRYSTALS

10 METERS PR Type Z-5.	Harmonic oscillator. Ideal for "straight through" mobile operation. High activity. Heavy drive without damage in our special circuit $5.00
20 METERS PR Type Z-3.	Harmonic oscillator. Low drift. High activity. Can be keyed in most circuits. High power output. Just as stable as fundamental oscillators $3.75
40 & 80 METERS PR Type Z-2.	Rugged, low drift fundamental oscillators. High activity and power output with maximum crystal currents. Accurate calibration . . $2.75

ZERO BIAS

EDITORIAL

THE SUPREME COMPLIMENT to any third party arbitrating a dispute is to have each of the parties involved consider that the decision is prejudiced in favor of the other. As we see it, that is pretty much what is happening with the report of the A.R.R.L. Planning Committee's recommendation concerning the sub-division of our most popular low-frequency bands for phone and c-w occupancy. We have received correspondence from partisans of both forms of emission, and each group denounced with equal vigor the "biased" report of this committee.

Perhaps the choice of the Committee's wording at the onset, when recommending an expansion of 75-meter phone which stated " . . . a small increase in the 'phone assignment without noticeable injury to c-w telegraphy," has created some of this mixed reaction. The c-w men feel no matter what, an injury is being done to them. The 'phone men feel that they are being thrown a sop, but nothing is being done to hurt the c-w man. The truth, of course, lies in between the two extremes.

Our own position was quite clearly stated in a number of previous editorials, but we want to restate it now, band by band. But before doing this we want to deplore one great inequality. We refer to the special consideration given to the Canadian amateurs. At the risk of alienating the affection of some of our Canadian readers, it does seem patently unfair that 50 kc on 75 and 20 be considered inviolable. There is a minute percentage of VEs working phone (or c.w.) as compared to Ws. Yet they are given, in addition to the regular U. S. assignments, full use of 10, 30% greater phone allowance on 75 and 30% greater on 20. Running power equivalent to the U. S. legal limit we feel that such special consideration, while very nice from the Canadian's viewpoint, is completely unjustified in the light of over-all spectrum assignments. Certainly an extra 25 kc should be adequate protection for QRM-free Canadian operation. The other 25 kc of that precious 50 kc might be more fairly given to U. S. phone stations (assuming that any general allocation in which Americans participated would be a W band by sheer weight of numbers.) Whether or not any group will put self-interest aside for the benefit of the majority has yet to be proven, but at least some effort should be made to convince the Canadians that this change would be desirable.

Looking at the bands individually our reaction is something like this:

3.5 mc: We feel that a widening of 75-meter phone can be accomplished without ill effect to anyone. 80 is the least crowded of the low-frequency c-w bands. The Board proposal would, in effect, split the band into two equal halves. We do think, however, that before this change is made every effort should be made to remove offending Latin American phone from the c-w portion of the band. If possible, they should be moved to the "Canadian 25 or 50 kc." Contrary to the Board's view about low-frequency foreign phone QRM, we think it has already assumed major proportions and is most objectionable on both 80 and 40, not to mention 20.

7.0 mc: Forty is a c-w band. We feel that it could support a phone band under certain conditions and have so stated. If it were possible to obtain international agreement to avoid having foreign phones occupy c-w assignments, then we can see where a phone band would be useful and desirable for Americans. Nevertheless, the Board has raised a point for which we see no possible solution and which underscores the weakness of the amateur frequency position on a worldwide basis. So few foreign stations are permitted higher than 7150 kc that an American phone band would in effect make 40 almost entirely a phone band. Placing a phone band on the low end would defeat any attempt to occupy 7200 to 7300 with A3 to combat foreign propaganda broadcasting. There seems no possible way to equally divide the band. It must be all phone or all c.w., and we feel that it is more useful as a code band.

Some amateurs have asked us why. Our reasons are twofold. Most important is that it is an ideal beginners' band enabling the neophyte to get going with simple equipment that still provides useful communications over reasonable distances. But propagation-wise, 7 mc is frequently open to all districts at one time. Phone operation under such conditions would be a bedlam that could easily make it worse than useless. On an all-or-nothing basis 7 mc should remain a c-w band.

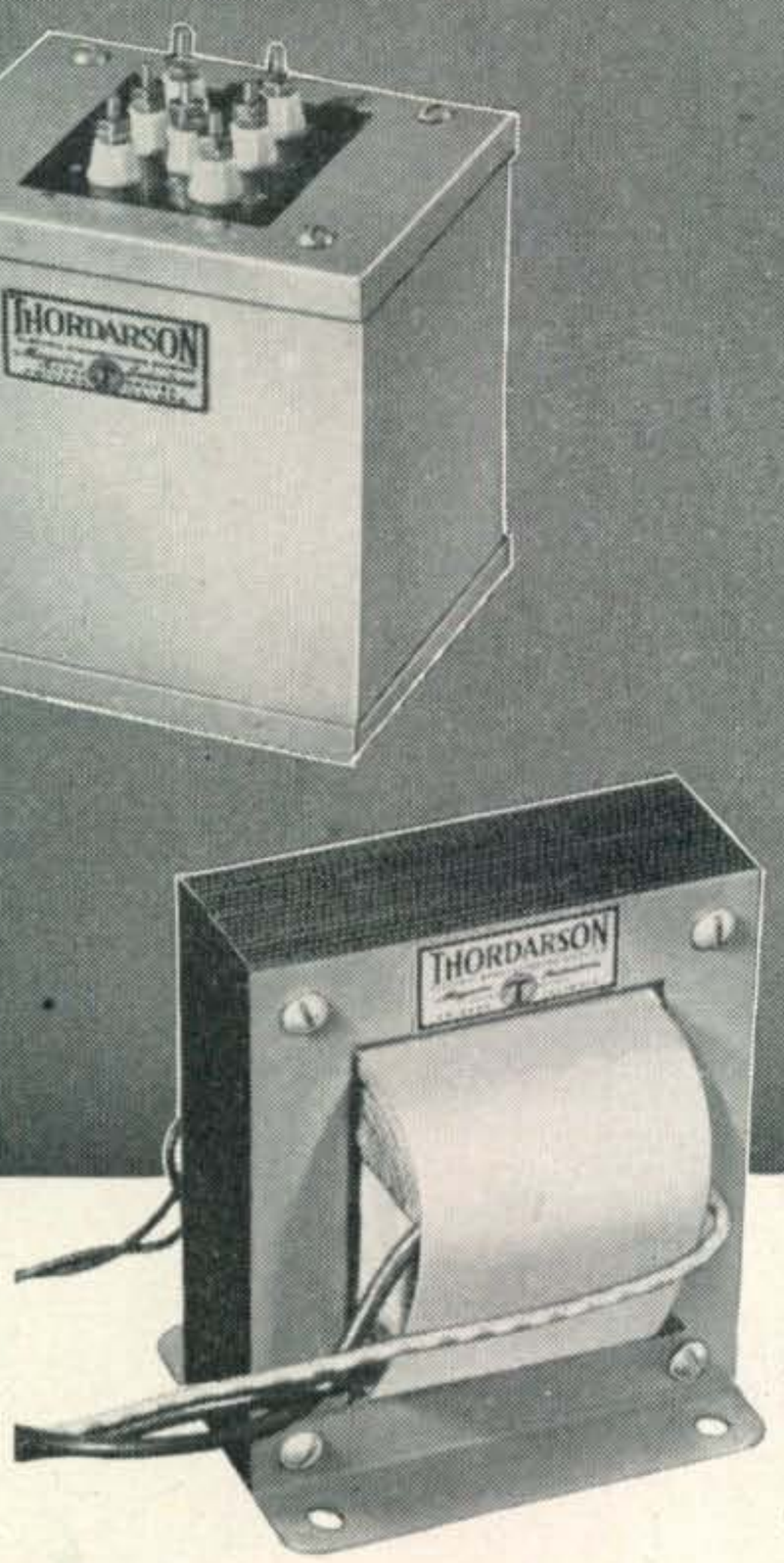
14 mc: Twenty is perhaps the most difficult of all the bands to deal with, again principally because of propagation conditions. Phone interference to c-w work assumes such proportions that it is useless to consider sharing frequencies; i.e., any portion occupied by foreign phones will be lost for code use in the States. The Board proposes that the band eventually will be 14,200 to 14,350. With the Canadian 50 kc this makes the phone band 14,150 to 14,350. Add to this figure an irreducible minimum of 50 kc for foreign phone stations and you have 20-meter phone band extending from 14,100 to 14,350 kc. A 100-kc c-w band is hardly better than none. We work 20-meter phone on occasion and admit that conditions are all but intolerable. A completed QSO is a mighty rare thing, but two wrongs do not make a right.

As we see it, at least 25 kc should be left on the high side of the band for foreign phone stations in an effort to reduce QRM in the c-w bands. The American band would thus stop at around 14,325 kc. It would seem that the solution to the 20-meter phone mess is strictly improved receiving and transmitting techniques. But at best we would want to see only a 25 kc phone increase for 20 and even this with great misgivings. Not because we don't think American phone men are entitled to more space, but because we must examine the question of band subdivisions on an international basis, and anything beyond a 50–50 division of bands will not be fair to the majority of American operators be they phone or c-w men.

28 mc: We feel that ten is a smooth operating arrangement. However, should the phone men feel it desirable to have the use of several hundred additional kc on that portion now denied to them, we can see no particular objection to it. In effect, we

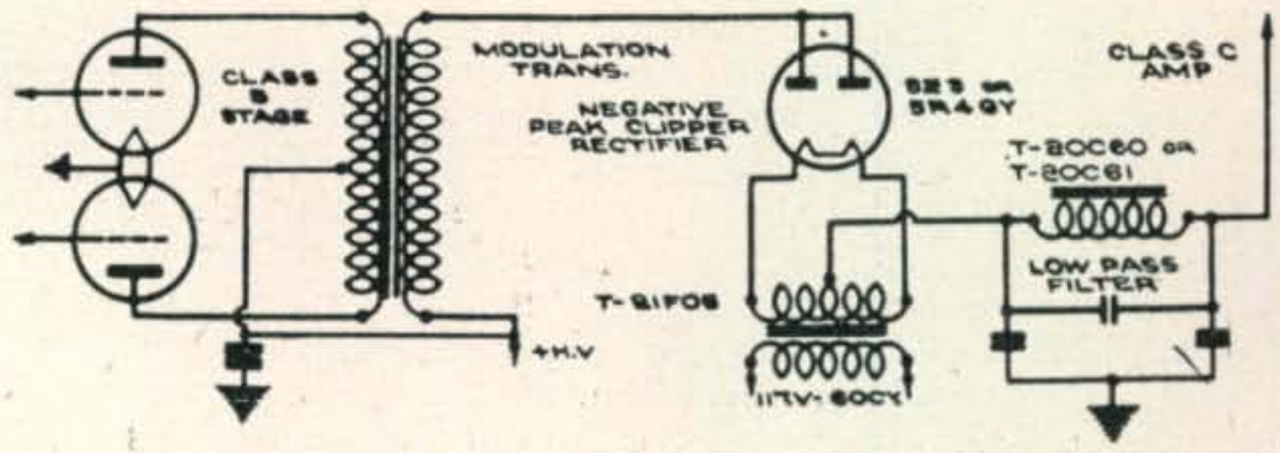
(Continued on page 102)

THORDARSON



THORDARSON SPLATTER CHOKES and NEGATIVE PEAK CLIPPER COMPONENTS are the AMATEUR'S PERFECT CO-OPERATORS

Ever mindful of the needs of the amateur operator, Thordarson engineers are constantly developing new applications for improved operations. With Thordarson equipment, the amateur is assured of the greatest thrills in radio . . . and Thordarson skill makes this superb quality equipment at popular prices.



The splatter suppressor circuit using Thordarson components as sketched here, greatly improves 'phone transmission on the crowded amateur bands. The circuit limits transmission to the important voice frequencies, effectively reduces splatter interference caused by high levels of modulation and permits a higher average modulation level.

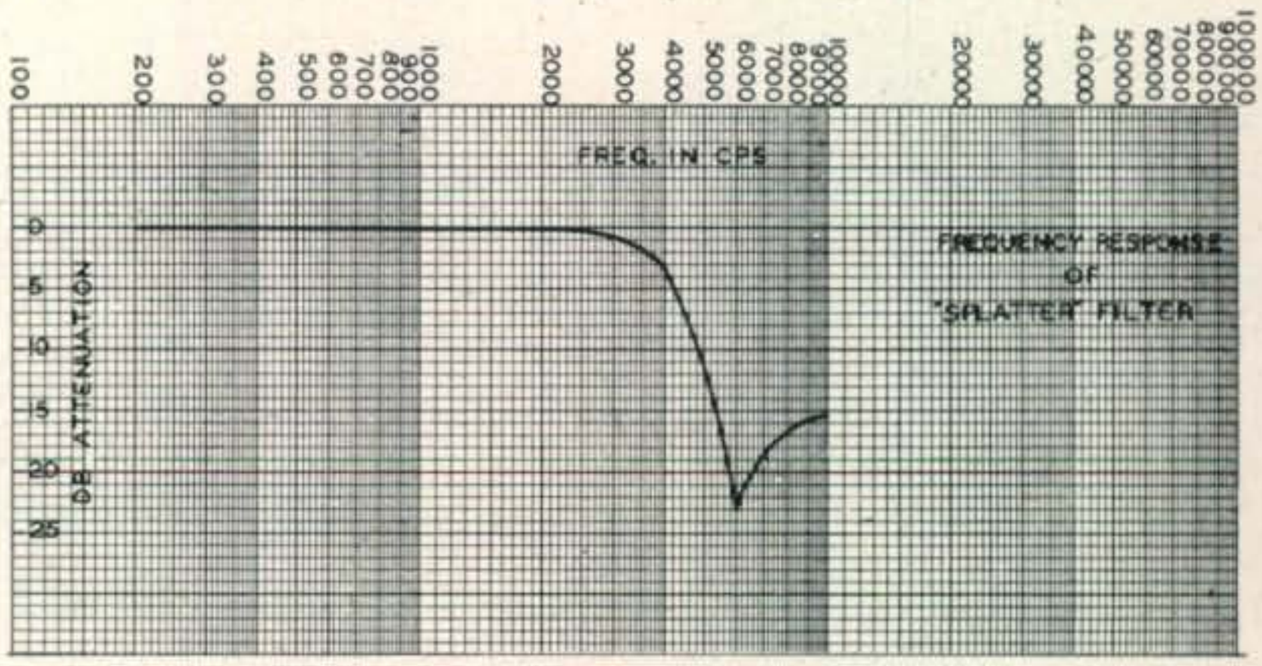
Sharper signals result by attenuation of audio modulating frequencies over 3000 CPS and elimination of harmonics generated in the speech amplifier.

The half wave rectifier is an efficient negative peak clipper which prevents plate voltage on the Class C amplifier from going below zero when the 100% modulation level is exceeded.

The circuit is ideal for use in original transmitter design and is readily adaptable to existing installations, either as part of the modulator or assembled on a separate chassis.

Complete instructions and charts furnished with each transformer.

Export — Scheel International Inc.
4237-39 Lincoln Ave. Chicago 18, Ill.
Cable — (Harscheel)



The Above Chart Indicates Graphically
The Frequency Response of the "Splatter" Filter!

THORDARSON

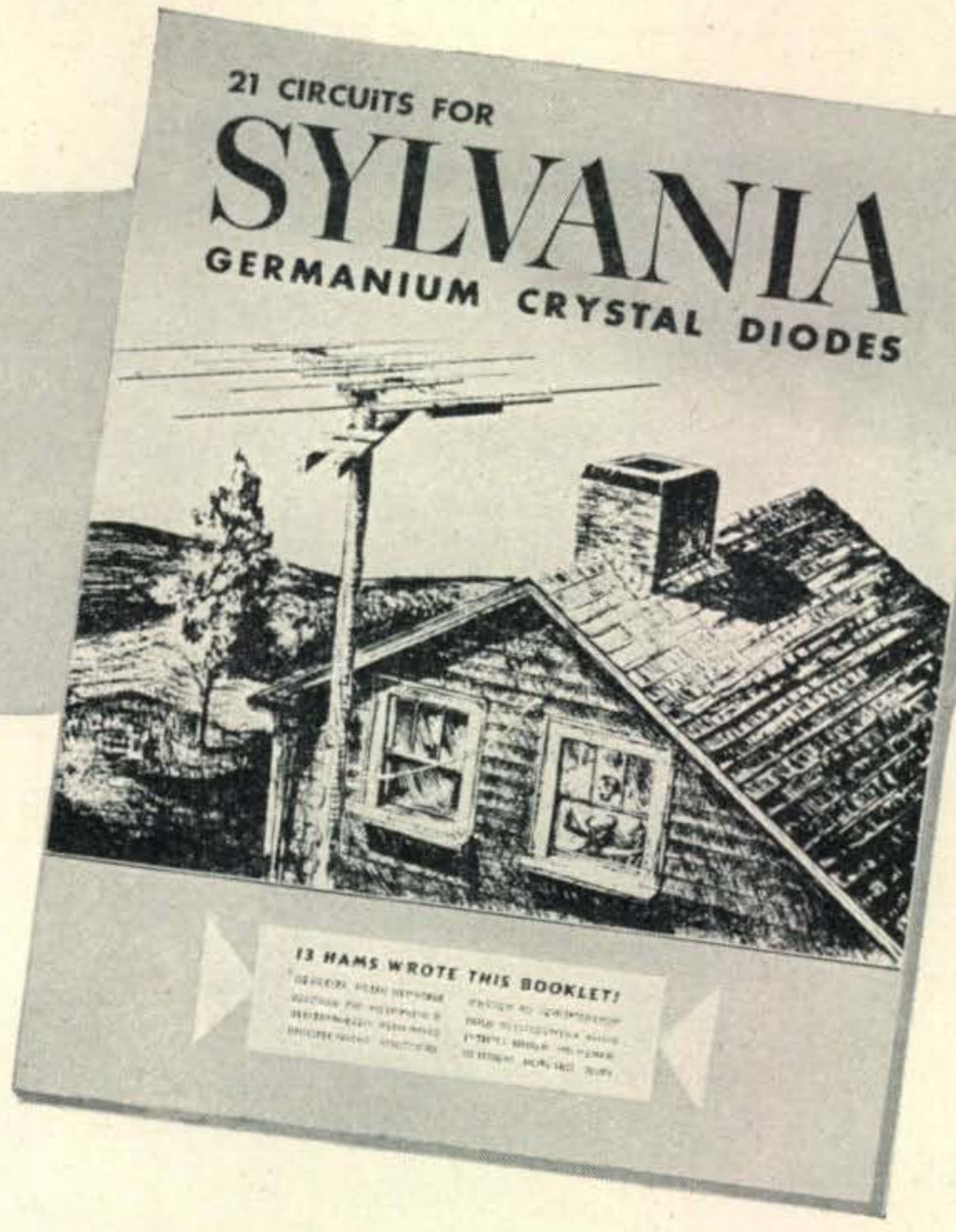
Manufacturing Quality Electrical Equipment Since 1895

500 WEST HURON CHICAGO 10, ILLINOIS

A Division of Maguire Industries

New dope on germanium crystal circuits

written by and for hams . . .



Here at last is a compilation of outstanding practical applications for Sylvania Germanium Crystals. Circuits were designed and tested by leading radio amateurs and submitted in a recent nationwide contest sponsored by Sylvania Electric. This new 8-page Sylvania booklet shows 21 receiver, transmitter and test and control circuits. Get your free copy—you'll find plenty of ideas in it to spark *your* thinking on Crystal Diodes.

SYLVANIA ELECTRIC

Radio Tube Division, Emporium, Pa.

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

Just mail the coupon for

FREE COPY

of idea-sparking bulletin

Sylvania Electric Products Inc.
Radio Tube Division
Advertising Dept., Room R-1704
Emporium, Pa.

Gentlemen:

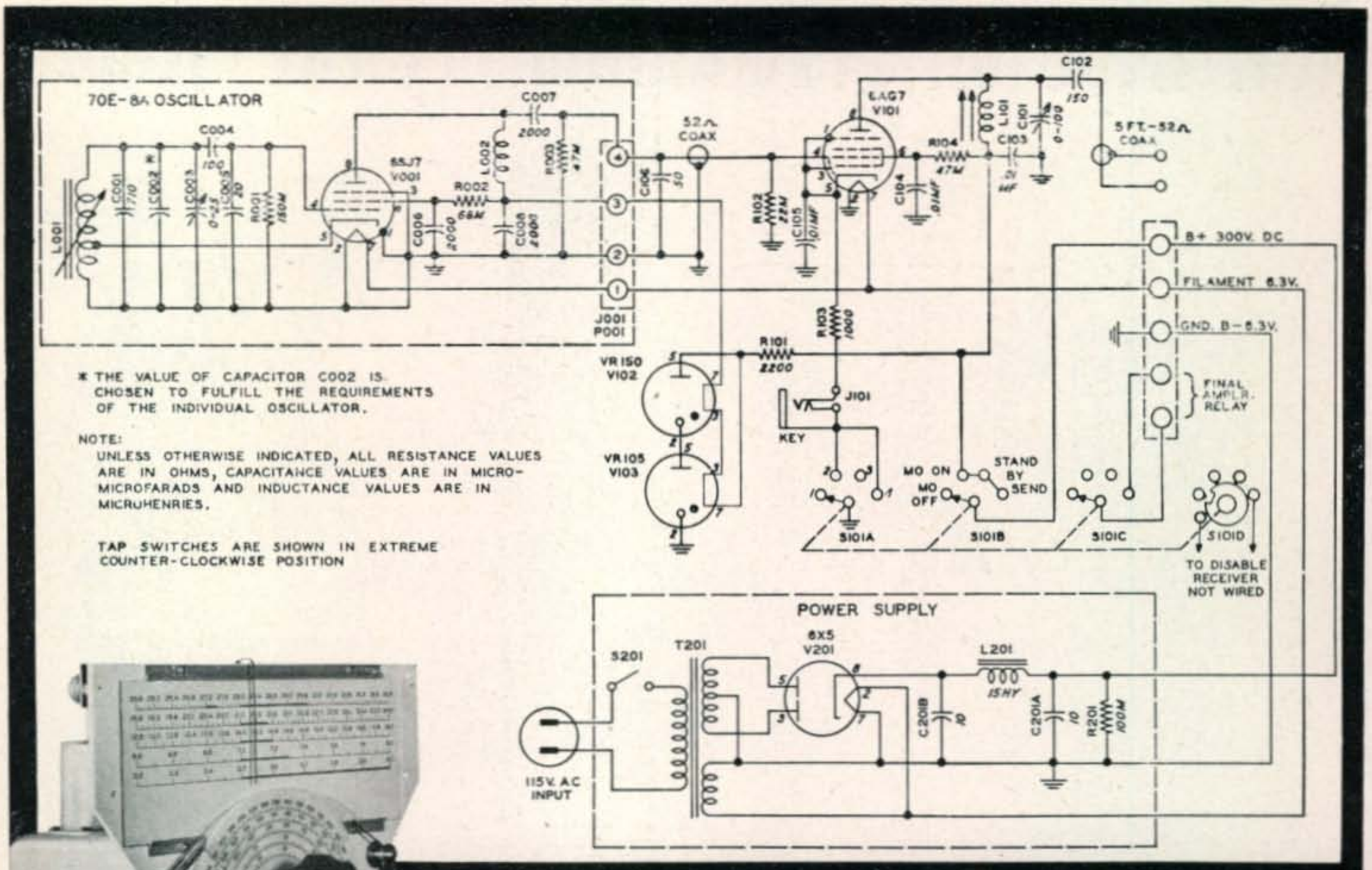
Please send me a copy of bulletin "21 Circuits for Sylvania Germanium Crystal Diodes."

Name .....

Address .....

City ..... Zone # .....

State .....



* THE VALUE OF CAPACITOR C002 IS CHOSEN TO FULFILL THE REQUIREMENTS OF THE INDIVIDUAL OSCILLATOR.

NOTE:
UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICRO-MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRIES.

TAP SWITCHES ARE SHOWN IN EXTREME COUNTER-CLOCKWISE POSITION

Collins 70E-8A

Tops for transmitter frequency control

The permeability tuned 70E-8A is a frequency generating device around which you can build an excellent r-f exciter with such features as direct dial calibration, excellent keying characteristics, even on 10 meters, practically no frequency drift, and stability that is usually associated with a crystal controlled exciter.

Each 70E-8A is individually calibrated to factory standards which specify that every 100 kilocycle check point from 3.5 to 4 megacycles must be set to within 500 cycles of the dial reading. To assure operation free from humidity effects this oscillator is baked until thoroughly dry, then completely sealed and moisture proofed. As an added protection against leakage a silica-gel capsule is factory inserted.

In order to achieve excellent keying characteristics in a r-f exciter it is desirable for the oscillator to run continuously, and for the keying to take place in a following stage. Due to the fact that the 70E-8A is completely shielded, it is possible to accomplish this without undue back wave interference, even when working break-in on the operating frequency.

The schematic shown here is suggested for a suitable exciter. The output of this exciter is on 80 meters, necessitating the use of the multiplier stages in your present rig to tune the higher frequency bands. The output will be approximately 80 volts across 40,000 ohms—ample to drive a 6L6 oscillator stage or an 807 buffer stage. Write for 70E-8A descriptive bulletin.

Net domestic cash price, complete with slide-rule dial, tube and instruction book, exclusive of state and local taxes, $40.00 F.O.B. Cedar Rapids, Iowa.

COLLINS RADIO COMPANY

Cedar Rapids, Iowa

11 West 42nd Street, New York 18, N. Y.

458 South Spring Street, Los Angeles 13, Calif.

Operating position at W2IOP in the 1947 Sweepstakes, with the output of the Collins 75-A receiver being fed into the T9'er. This station had one of the outstanding scores in the SS.

The T9'er

EUGENE BLACK, W2ESO*

All the conveniences of the idealized operating position are incorporated in this one unit. Break-in keying, a self-contained monitor, and receiver blocking are among its features.

THE T9'ER has two features that set it apart from the conventional type of keyed v.f.o. It puts out a keyed signal free of *any trace* of click or chirp, even when multiplied to the 28-mc band, while permitting full break-in on any frequency. It also contains provision for gating off the receiver output, thus eliminating one of the major causes of fatigue in traffic and contest operating.

A block diagram of the circuit is shown in *Fig. 1*. The difference beat between a continuously running crystal oscillator and a continuously running variable-frequency tuned-plate oscillator is developed in a conventional mixer tube, fed through a band-pass filter to eliminate the two oscillator frequencies and the undesired sum beat frequency, and then amplified by a 6AG7 broad-band Class-A stage.

The auxiliary circuits include an audio keying monitor with variable pitch and amplitude, and a "reverse-keyed" audio amplifier, which slightly amplifies the incoming signal from the receiver when the key is up, but which is cut off when the key is closed, permitting only the monitoring signal to reach the phones. The blocking bias is obtained by rectifying some of the audio oscillator output; this permits removal of the gating action by simply turning off the audio oscillator, when checking v.f.o. frequency, or whenever it is desired to monitor keying in the receiver.

One other unconventional item is an optional re-

* *449 West 56th St., New York 19, N. Y.*

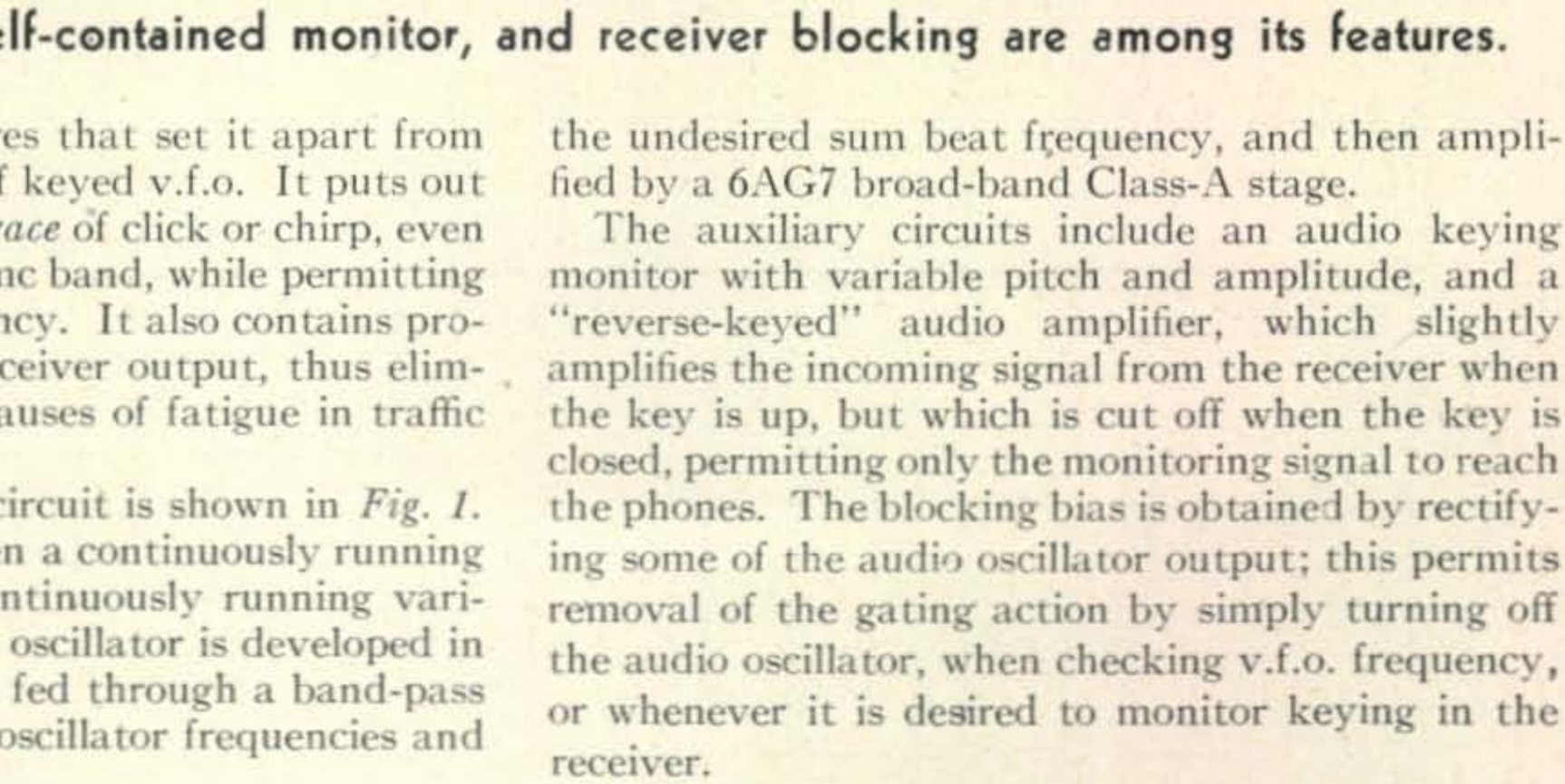


Fig. 1. Block diagram of the T9'er including the keying monitor and receiver gating circuits.

lay shorting the receiver input, for use when operating with high power under conditions where receiver pickup might be excessive. Time constants in the keying circuit cause the relay to hold over, thus eliminating the clatter of a relay following keying, but still permit the other station to break between words, or allow the operator to check a channel with a very brief pause.

The use of a conversion type of exciter is certainly not an innovation in ham radio (the first "Flextal" article appeared in *Radio* in 1936), but the advantages of using the difference-beat seem to have been overlooked in the past. The decision to use it in this v.f.o. came only after considerable experimenting with various keyed oscillators, shielded continuously running oscillators, and the more conventional sum-beat mixer types. The directly keyed oscillator was rejected because it was *impossible* to avoid making some sort of compromise between having a chirp or having a click, especially when working 14-mc and 28-mc c.w. A further disadvantage was that the integral relationship between the oscillator frequency and the output frequency permitted feedback troubles under some conditions.

A well-shielded oscillator, running continuously on a sub-harmonic of the output frequency, with keying in a subsequent stage, is a definite possibility for clean keying with break-in, and has been successfully used by a number of hams. It is a difficult mechanical job to build a v.f.o. with this degree of shielding, however, and unless all stages following the keyed stage are cut off (gm reduced essentially to zero), considerable care must be used to get the r-f leakage down well below the point where it alone would be acceptable, to prevent the idling stage or stages from building the residual signal back up to an annoying level—and, of course, a string of overbiased stages can do a nice job of squaring up the keying envelope.

Sum-Beat vs. Difference-Beat

The sum-beat heterodyne exciter, which has been described in a number of articles in the past, has never acquired much popularity, probably because its one main advantage over simpler types—the fact that it is practically foolproof against r-f feedback roughening up the note—is not enough to offset its general complexity and inherent weaknesses for all-around ham use. If the low-frequency variable oscillator is operated at frequencies of a few hundred kc, both the fixed (crystal) oscillator and the unwanted modulation sideband fall so close to the desired frequency that rejection becomes difficult, and the use of a balanced modulator is practically a necessity. If a somewhat higher frequency is chosen for the variable oscillator, these troubles are minimized, but it then doesn't take a very-high order harmonic of the variable oscillator to reach the crystal frequency or the output frequency—and whenever a low-order oscillator harmonic, repre-

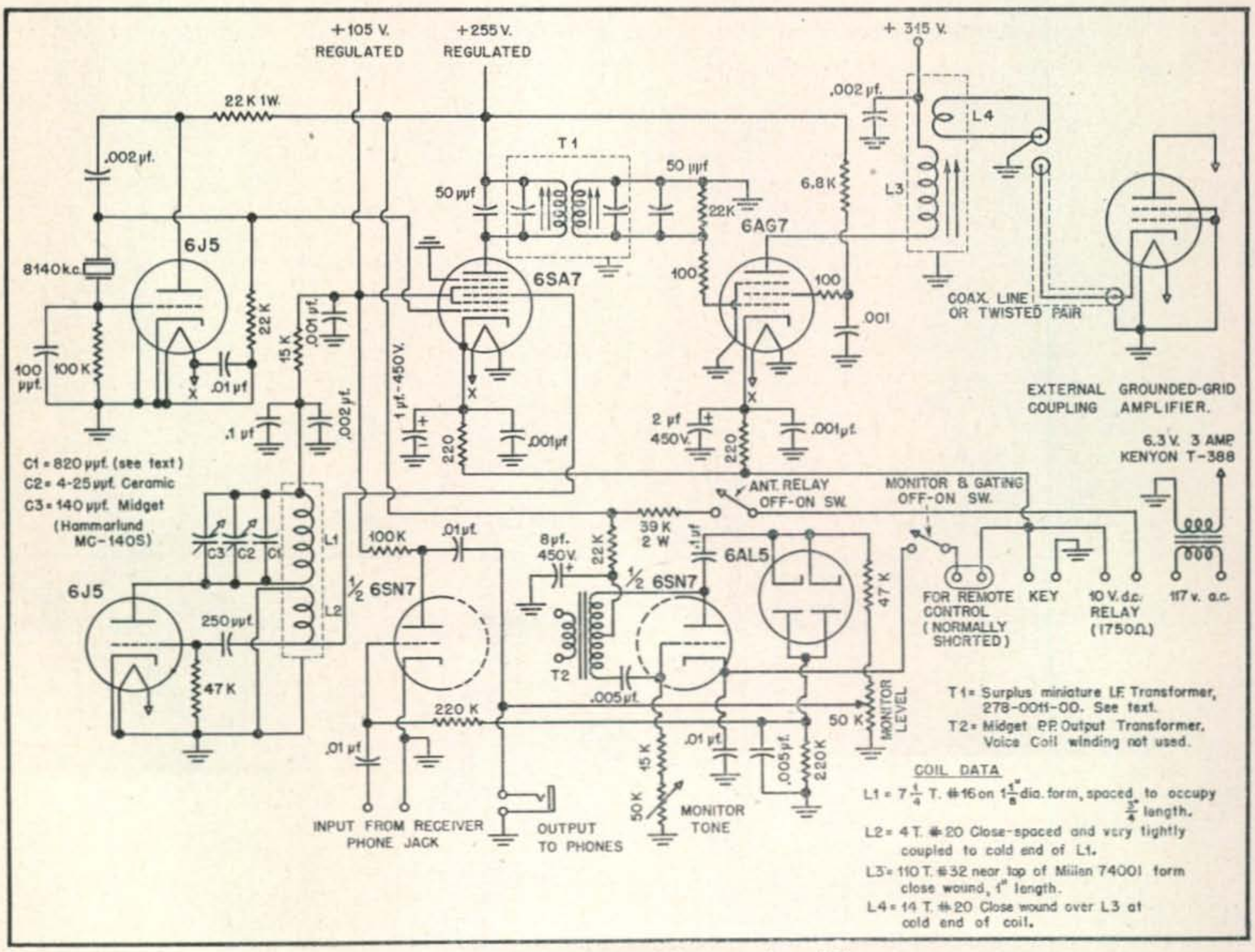
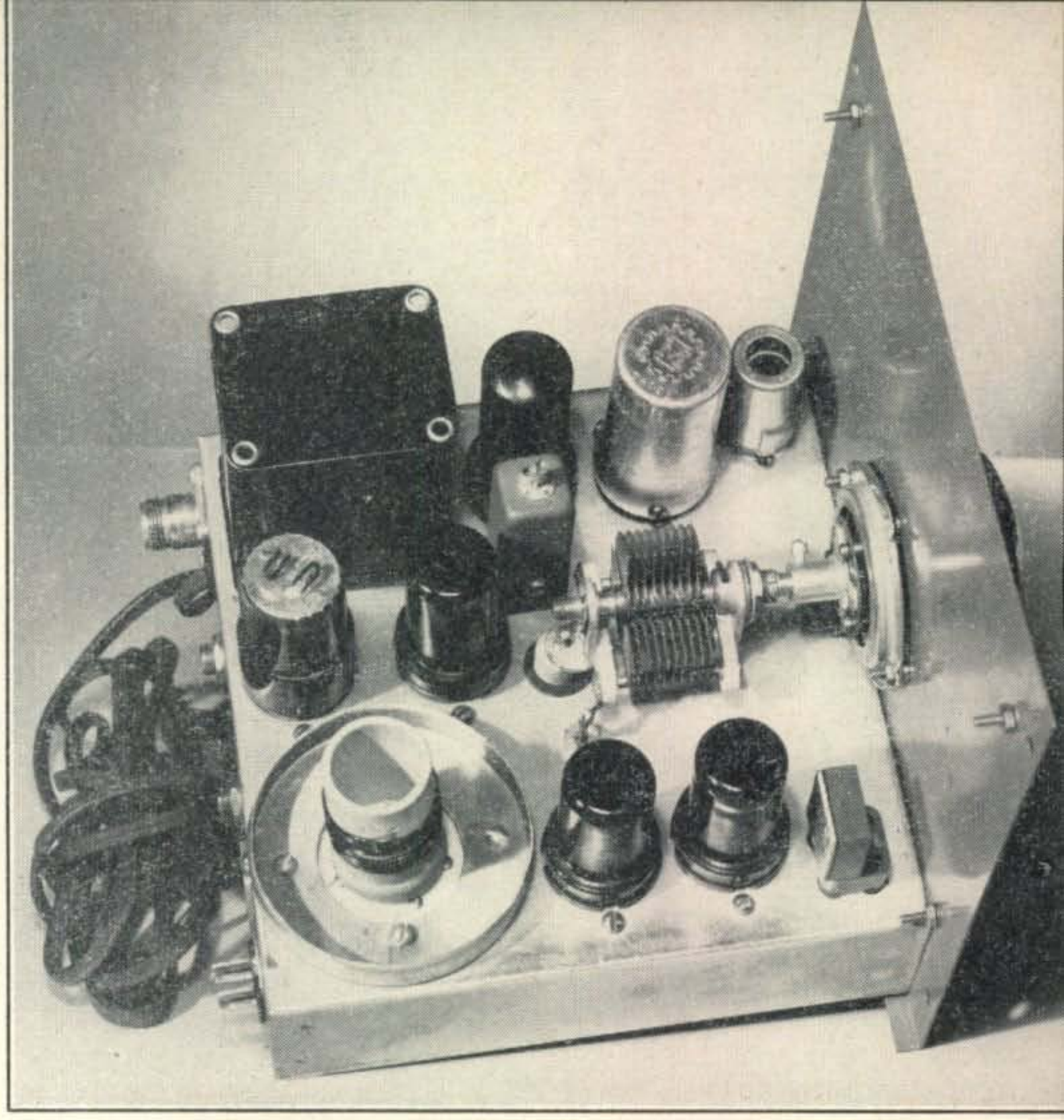


Fig. 2. Circuit diagram of the complete T9'er.



The T9'er out of its case, with coil shield removed. Starting in the lower right-hand corner and going clockwise, we find the 8140-kc crystal, the 6J5 crystal oscillator and the 6J5 variable oscillator. Above the oscillator coil is the 6SN7 audio amplifier and keying monitor, and to the right, the 6SA7 mixer. From left to right, at the top, filament transformer, the 6AG7 amplifier and its plate coil, using one of the Millen forms, and the 6AL5 rectifier in the upper right-hand corner. The miniature i-f transformer is just below the 6AG7 in this view. Note that only one tuning condenser is used, eliminating all tracking problems.

senting appreciable voltage, crosses over either the crystal or output frequencies, or harmonics of either, there is a chance for recovery of the audio beat and consequent audio modulation of the signal. In any event, if mixer keying is desired, to avoid the compromises of oscillator keying, it is necessary to take steps to prevent harmonics of the l-f oscillator from interfering with the incoming signal.

The whole thing becomes much simpler if the difference beat is used. Crystals of odd frequencies are now readily available, and it is only necessary to watch a few points in selecting the operating frequencies for the two oscillators. The first, of course, is that neither oscillator shall operate in, or have harmonics falling in, any amateur band in which operation is contemplated. A second important consideration is that low-order harmonics of either oscillator shall not cross over each other, or coincide with harmonics of either beat product, or with the sum beat. Since this does not occur with the values used in this model, anyone desiring to copy it can do so without further concern. For those who might want to use different frequency ranges, the following example may clarify the reasons for this requirement.

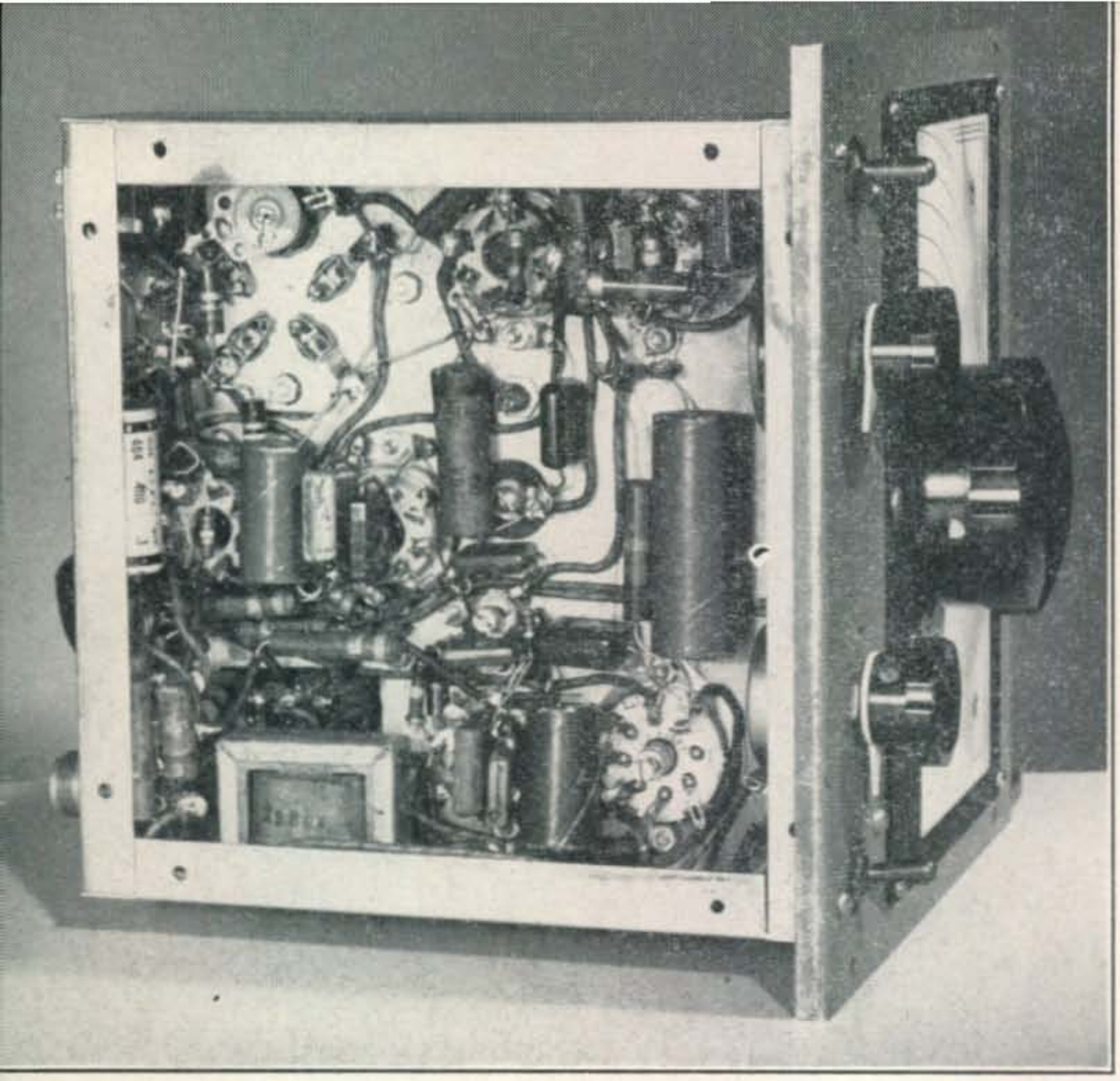
At one stage of development, the crystal in use was on 8306 kc, with the variable oscillator covering approximately 4806 kc to 4456 kc in order to obtain output from 3500 to 3850 kc. While this permitted the variable oscillator's third harmonic to fall in the 14-mc band, at first this did not seem too serious, inasmuch as the harmonic was quite weak and approached the operating frequency only in the phone region; it was reasoned that this combination could be tolerated, as the plate supply to the v.f.o. could be shut off during listening periods while on phone. However, it was noted that a rapid-tuning audio modulation could be obtained when working around 3560 kc, and this was found to be caused by the third harmonic of the variable oscillator, working on approximately 4746 kc, beating with the fourth harmonic of the difference beat frequency—i.e., $3 \times 4746 \cong 4 \times 3560 = 14240$ kc. The change to a crystal of 8140 kc eliminates this effect, and any crystal in this region not higher than 8162 kc will be equally satisfactory.

There is a disadvantage in making the crystal frequency too low in that it then becomes more difficult to reject the variable oscillator frequency in the mixer output. It would be possible to operate the variable oscillator at a frequency higher than that of the crystal oscillator, of course, but it is good engineering practice to keep the self-excited oscillator on the lowest possible frequency, to obtain best relative and absolute stability.

A very minor consideration is the possibility of one of the oscillators causing an image response. With the practice of both stations working on the same frequency being pretty much standardized, the most annoying instance of image interference would occur when the oscillator happened to be on the image of the operating frequency. In this case, it works out to be 3615 kc, and with the receiver in use at W2ESO (an NC 240-D) it is necessary to drape the receiving antenna inside the v-f-o cabinet before any trace of the image can be found.

Oscillator Circuit

The oscillator circuits are conventional; the plate tuned oscillator was chosen for the variable one since the grounded cathode eliminates possibility of hum and instability arising from leakage, and the low



No development model can look like a production job, but then there is a fair amount of stuff packed into a 7" x 7" x 2" chassis. Note the heater bypass condenser placed between the two oscillator tubes in the upper right-hand corner, to serve as a shield, while bypasses grouped around the 6AG7 socket in the lower right-hand perform a similar function. Reading from the top down, the small controls are: Relay switch, audio tone, audio monitoring, sidetone level and gating switch. This picture was taken before the dial scale had been calibrated.

impedance tickler offers the chance to drive the keyed mixer without requiring an intermediate buffer stage. The 820-$\mu\mu$f silver-mica condenser in the oscillator plate tank was selected from a half-dozen of this value, and is actually on the low side, to permit covering 3500–3800 kc with a bit of leeway. This condensor does not show in the photographs, being mounted on the coil socket directly below its associated band-setting ceramic trimmer. Following usual practice, the tickler is made as small (in inductance) as possible, and is partially interwound with the cold end of the plate coil. The coil shield is desirable, inasmuch as a residual signal can be caused by mixing in either one of the oscillators, if undue voltage from one should get into the other.

The mixer is also straightforward, even to the point of having an i-f transformer in its plate circuit. This particular one is a surplus job of rather poor Q, designed for use at a higher frequency but brought to frequency with small mica condensers across both windings. Undoubtedly a much more efficient unit could be made by stripping down an old 1600-kc or 3.0-mc transformer, preferably one in which the coupling could be varied. As used here, the primary and secondary are staggered to achieve a band-pass effect, with considerable loss of voltage transfer compared to what can be obtained when both sides are tuned to the same frequency. Enough voltage is obtained to drive the following 6AG7 to more than sufficient output for normal requirements, however.

The 6AG7 required a bit of cooling off, exhibiting at first both a high frequency parasite and a tendency toward self-oscillation. Series resistors in grid and screen took care of the former, while installation of the shielded slug-tuned form pretty well stabilized the stage. The plate circuit tunes very broadly, but helps to fill up a hole caused by a drop in excitation in the middle of the band. The pickup link is somewhat oversized, being intended to feed into the cathode circuit of a grounded-grid triode connected 6L6; a suitable dummy load for initial tests on the v.f.o. is three or four 6.3-v. 150-ma dial lights, series-connected.

The Audio Oscillator

The audio oscillator is old stuff, of course; the decoupling in its plate supply circuit is necessary to keep from modulating all the r-f circuits in the v.f.o. The audio level control is arranged to keep from affecting the receiver output level too markedly, but does short the phones when turned all the way down. I forgot about this and turned the knob too far one night when the phone rang—and then almost tore the v.f.o. apart later looking for the shorted something or other in it.

The rectifier and keyed audio amplifier operation are also obvious from the circuit diagram. Don't try to use a 1N34 or surplus radar crystal in place of the 6AL5; the blocking oscillator puts out a jagged waveform whose maximum amplitude read over 200 volts on a peak reading v.t.v.m.—way over the peak ratings on these crystals. The time constants in the rectifier load circuit are about right for average speeds in contest and traffic work; the blocking oscillator pulses when integrated by the rectifier produce an average d.c. much lower than their peak value of several hundred volts, but more than enough bias is developed to keep the audio amplifier cut off, even when monitoring my own signal with the receiver's audio gain control wide open.

Keying is accomplished by breaking the cathodes of the mixer and Class-A stages. When keying the mixer alone, a slight residual signal on the operating frequency can be found when the 6AG7 is followed by amplifiers not completely cut off. No effort has been made to determine if this can be eliminated by

more thorough isolation of the oscillators or by adding shielding, since there is no disadvantage in keying both stages. The large cathode bypasses not only serve to shape the keying, but also prevent the audio oscillator from modulating the r.f. No chokes are needed in the key leads; when tried, it was found that even the slight impedance at audio frequencies presented by an r-f choke (probably no higher than its d.c. resistance) was sufficient to permit some common coupling between the audio oscillator and the r-f amplifiers, modulating the note slightly. This could be heard in the shack, but apparently did not get out; at any rate, it is a point to be watched.

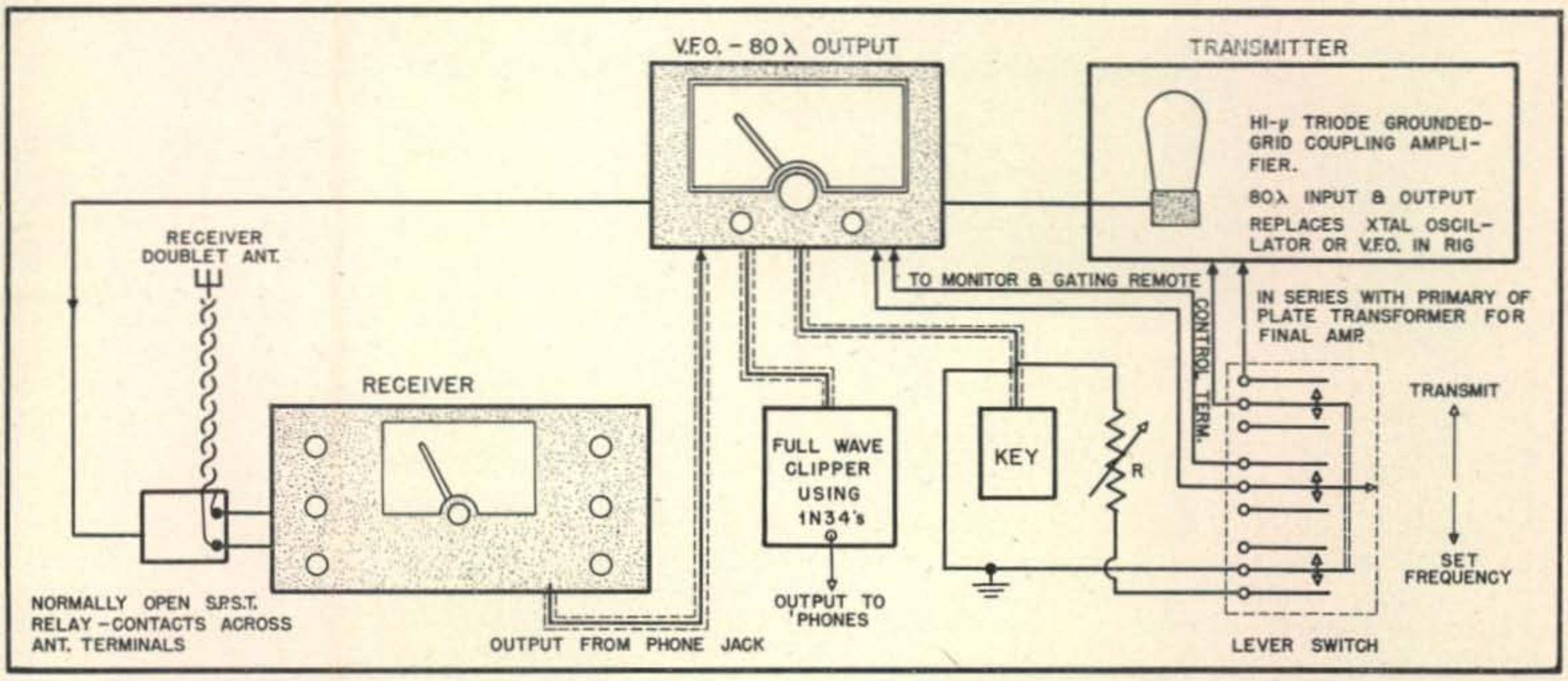
The power supply is not shown because it is standard. A 375-volt 100-ma transformer runs the v.f.o. with enough d.c. left over for a frequency standard. A VR105 and VR150 in series do the regulating, and application of regulated voltages to the mixer is a considerable help in keeping the signal free from chirp under keying.

Due to the high lumped capacity in the oscillator tuned circuit, the dial calibration with the straight line capacity midget specified is essentially linear, running just under 3.5 kc per dial division. Drift was checked at 3600 kc by zero beating the v.f.o. against a reliable 100-kc crystal standard, then measuring the deviation with a Hewlett-Packard 200-C audio oscillator and a 'scope. From a cold start, total drift at the end of two hours was less than 1 kc, and the drift rate was negligible at the end of this period; this seemed good enough, so no attempt was made at compensation. Inclusion of the filament transformer permits running the heaters alone if there is any need to stabilize the v.f.o. before an operating period, and subsequent runs have shown that running the heaters alone for an hour or so is sufficient to stabilize the unit so that application of plate voltage does not cause additional drift. The dial and condenser run "backward," incidentally; that is, the condenser must be rotated toward minimum capacity to move the output frequency lower, since the difference beat is used.

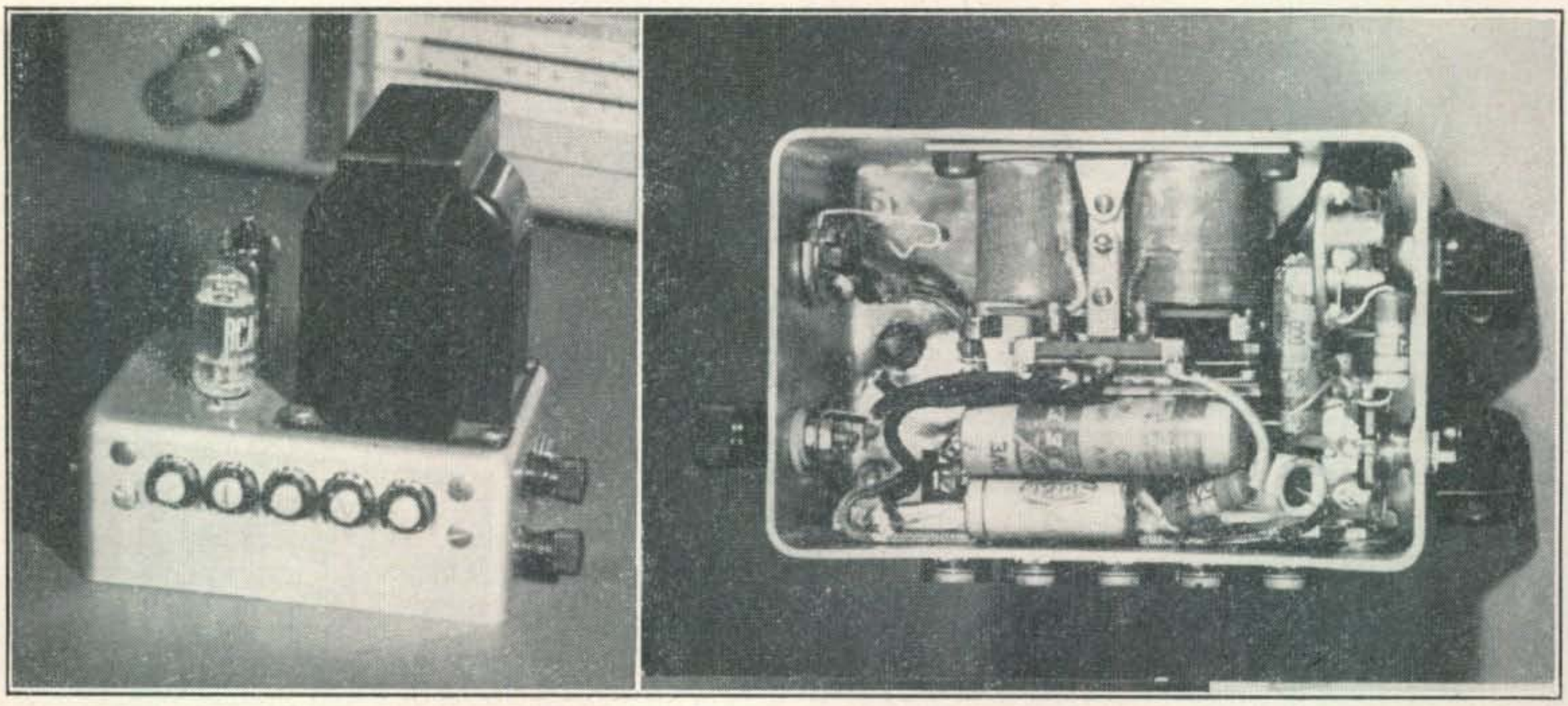
Construction Precautions

Anyone attempting to duplicate the unit should have little trouble. The biggest problem would probably be alignment of the interstage transformer. If you are lucky and come close enough in your initial adjustments, preliminary tuning may be done with a well-shielded receiver, subsequently aided by a neon bulb and dummy on the 6AG7 output link. A better way would be to disconnect 6AG7 output plate and screen voltages, and then insert a well bypassed d-c meter in the grounded lead of the secondary of the transformer, thereby using the grid and cathode of the 6AG7 as part of a diode v.t.v.m. A check should be made for reaction on the variable oscillator under keying. This should be done by listening to the 7th harmonic of the plate-tuned oscillator while keying dashes, using a very low beat note. The shift in this unit while listening to the oscillator harmonic on 31 mc is so slight that it is necessary to first zero beat the harmonic to hear the change in frequency to a barely audible beat.

There are a few variations which could be added. For instance, the frequency range can be shifted without touching the variable oscillator, or adversely affecting its stability by adding switching if the crystal of the fixed oscillator is changed. Provision was made for this initially, with the thought of covering 3500-3650 kc and 3650-3800 kc in two ranges, for easier tuning on the 7 and 14-mc bands, but this was found unnecessary. The crystal could also be switched to allow operation on the 27-mc band, for example. The present unit would require retuning of the bandpass coupler, but this could be avoided by proper design. The sum beat could be selected optionally, for multiplication to the 50–54 mc band—the present choice of frequencies produces



Control circuits used with the T9'er at W2ESO. Resistor R is a 50,000-ohm potentiometer, mounted in a control box with the level switch; the latter is a heavy duty anti-capacity switch. In the "transmit" position, final plate power is on, and sidetone and receiver gating are available. In the "set frequency" position, final power is off, receiver gating and sidetone are cut out, permitting the v-f-o signal to be spotted on the receiver, and the key leads are shorted through "R." Adjustment of "R" controls v-f-o signal level in receiver, while setting frequency.



Two views of an outboard audio oscillator and gated amplifier using miniature tubes, built by a member of the CQ staff for use with an existing v.f.o. Since this unit was mounted close to the receiver antenna terminals, the antenna shorting relay was mounted inside the unit.

a sum beat going from 12.46 mc to 12.785 mc, which multiplies into the 50–51.1 part of the band. Care would have to be taken to reject the oscillator third harmonic, however. Inclusion of 3.9-mc phone coverage would be difficult, if full coverage right down to 4.0 mc were required, inasmuch as the variable oscillator would be less than 200 kc away from the desired output frequency; sufficient rejection would not be obtained unless the oscillator signal were canceled out in a balanced modulator.

However, there are always things that would be done differently if you had the job to do over again, and in this case, while I might not go in for any of the above ideas, I would put the gismo in a bigger cabinet to allow space for the frequency standard and the output clipper. The latter is not used to limit noise pulses as much as it is to knock the edges off the keyed sidetone going into the phones, and to keep some local from knocking your ears off when you are digging for a weak one with the gain wide open.

Last of all, I wouldn't tell W2IOP what sort of brain child I had given birth to, or else I would again be off the air a month before the Sweepstakes while he got the hang of it, during the SS while he was knocking himself out with it, plus a cooling off period after the contest while he was getting used to the idea of doing without it.

Superconductive Detector

At a recent meeting of the Franklin Institute, Dr. Donald H. Andrews announced that superconductive rectification could detect radio signals in the region of 50 to 110 megacycles. Previously, the bolometer low temperature detector had only been known to operate around the long-wave and broadcast band spectrum.

The superconductive bolometer is a new instrument developed by the Johns Hopkins University for the detection of infra-red radiation. The rectification of radio energy was an accidental discovery made in the spring of 1947 by Major Clark and Dr. Andrews. The bolometer consists of a minute ribbon of columbium nitride cooled to a temperature of −259° centigrade, or about 14° Kelvin. It has been found that in cooling some metals there is a certain transition state when radio signals may be detected.

The property of superconductivity was discovered at the University of Lyden in the Netherlands. Upon cooling a few metals and alloys below 7° Kelvin a state is reached where the resistance of the metal drops from its normal value to zero. It is known for example, that an electric current induced in a doughnut shaped lead ring will keep traveling around the ring as long as it is cooled to super-conductivity. This phenomenon appears to violate physical reasoning since at these low temperatures it would be more probable that all electron, molecular and atomic motion would be arrested.

The low temperatures necessary for this work can only be reached through the use of liquid helium and hydrogen. The super-cooled liquid is then placed in a cryostat which is attached to the bolometer. The bolometer is prepared by cementing a very small strip of columbium nitride to the top of a copper block with bakelite lacquer. The copper block is in contact with the liquid hydrogen. The bolometer is then placed in a copper shield with only a rock salt port or window. When the internal temperature of the bolometer is maintained at the critical transition temperature any heat producing radiation (particularly infra-red radiation) passing through the window and falling on the columbium strip will change the effective temperature and vary the resistance between normal and superconductivity. This change in resistance is converted by a voltage drop into a pulse which is then amplified in the usual fashion by a Class A audio amplifier. The change in temperature may be less than a ten-thousandth of a

(*Continued on page 101*)

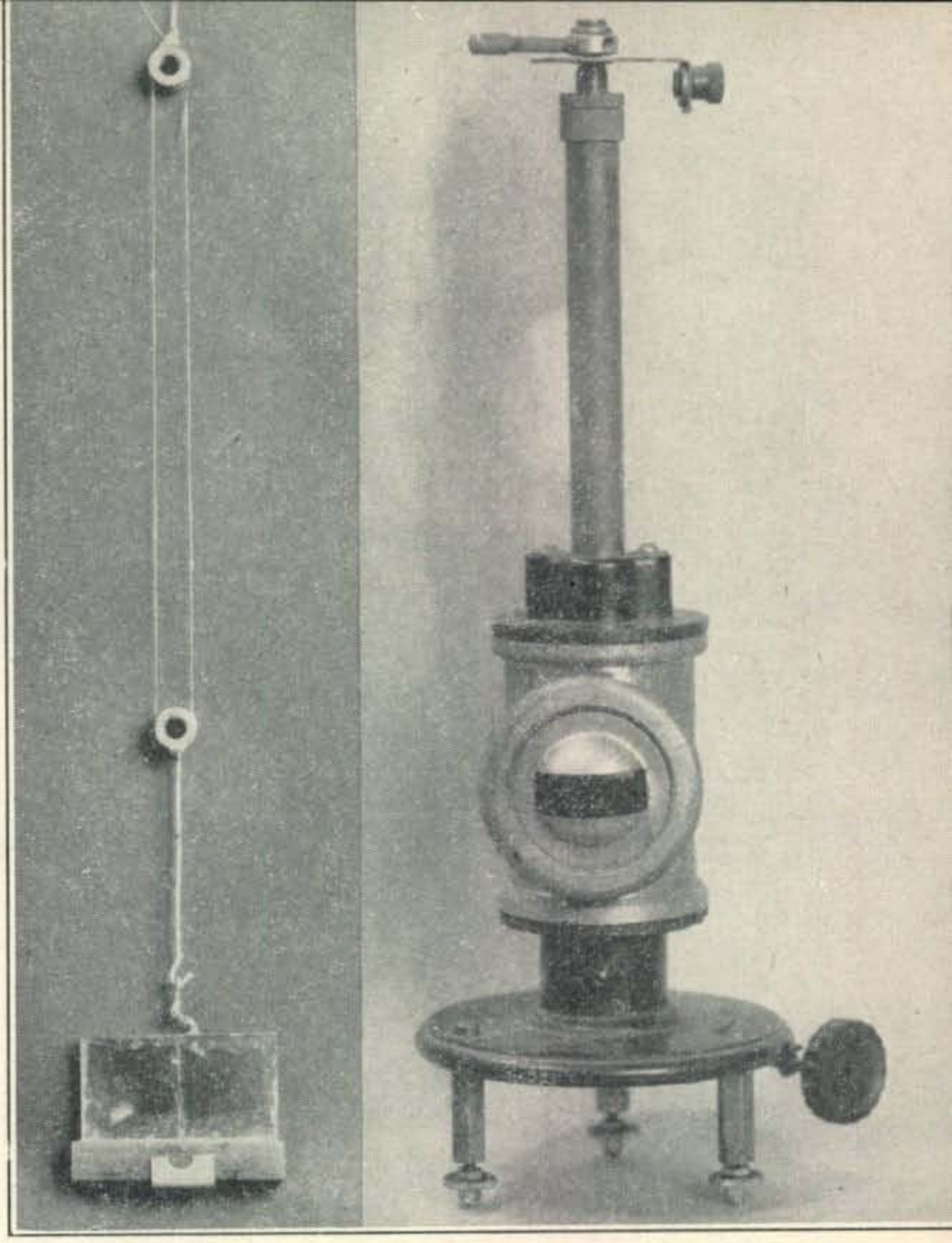


Fig.1 (left). The small mirror and magnet used in the variometer. The two glass fibers pass over pulleys to equalize the tension. Fig. 2 (right). The junk-box variometer for detecting ionosphere storms. The mirror and magnet shown in Fig. 1 are suspended inside of this housing to prevent their deflection by air currents, etc.

An Ionosphere Storm Indicator

J. F. McCUTCHAN, WØHXY*

The best way to be in on 6-meter aurora openings is to be forewarned of them. This simple instrument gives 5 to 10 hours advance notice of impending aurora.

THE RELATIONSHIP between solar activity, the ionosphere and the magnetic field of the earth is well known. Perhaps not so easily realized is the fact that present geomagnetic theory indicates that the ionosphere is the "return path" of the magnetically induced currents in the earth's surface. This will give rise to the effect noted during severe ionosphere disturbances when the wire lines and telephones over long distances go temporarily dead from the high induced voltages (generally, long lines are balanced to ground so as to counteract any normal amount of induction).

Almost all ionosphere storms are associated with some form of auroral activity. As all 6-meter amateurs know, aurora provides a means for communication via c.w. over the intermediate distances between the outer edge of the ground wave and the inner edge of the sporadic-E skip zone. Generally, however, the auroral activity that affects 50 mc occurs during the first phase of the ionosphere storm. Therefore, it would be advantageous to have some device that would warn us in advance (4 to 10 hours) of impending aurora.

This may be done quite simply by measuring the magnetic field intensity of the earth and noting any violent departures from the normal diurnal and seasonal characteristics. This is possible since the changes in the magnetic field generally begin a number of hours before the aurora borealis is visible.

The H Intensity Variometer

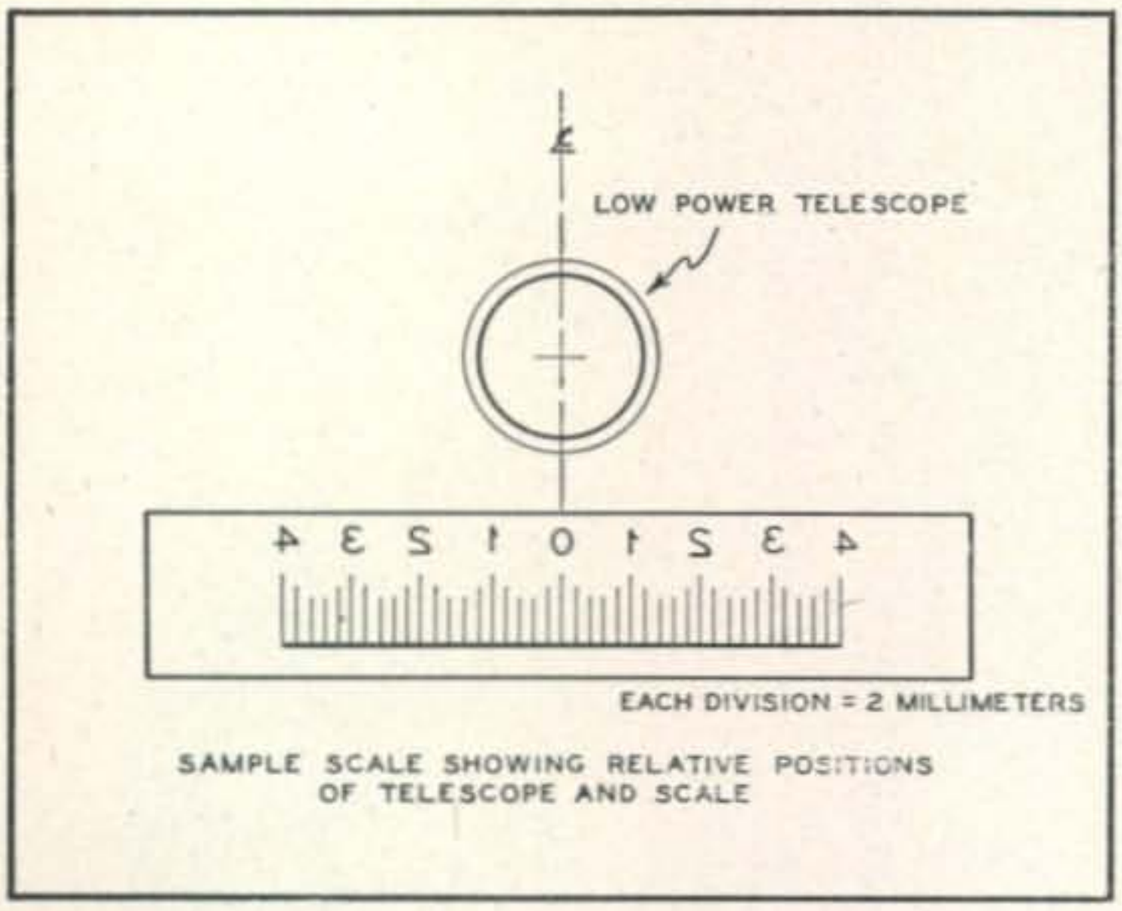
After browsing through various publications on terrestrial magnetism it was decided to try to build a horizontal (H) intensity variometer. This instrument measures the horizontal component of the magnetic field and indicates any variation in its intensity along the earth's surface.

Essentially an H intensity variometer consists of a horizontal permanent magnet suspended freely on a single fiber. The magnet lies perpendicular to the earth's magnetic meridian. In order for the suspended magnet to remain in this position in spite of the magnetic pull on it, it is necessary to counteract the magnetic couple on the magnet by a mechanical couple in the suspension.

As long as the mechanical couple in the suspension, the strength of the suspended magnet, and the intensity and direction of the earth's magnet field remain constant there will be no change in the angular position of the suspended magnet itself. However, during a magnetic disturbance the intensity and direction of the earth's field will change materially and it is in these changes that we are particularly interested.

There are two common types of suspensions for the magnet system. The *unifilar* suspension consists of a single fiber and the counteracting couple is produced by the torsional rigidity of the fiber. In the second arrangement—the *bifilar* suspension—the magnet is supported by two fibers a small distance apart. In practice, the two fibers constitute a single fiber which passes around a pulley attached to the magnet system and which is fastened vertically above the magnet. The purpose of the pulley is to equalize the tension in the two halves of the fiber. A mirror is attached to the suspended magnet so that in it can be seen the reflection of the illumi-

* *521 3rd Ave. South, St. Cloud, Minn.*



SAMPLE SCALE SHOWING RELATIVE POSITIONS OF TELESCOPE AND SCALE

Fig. 3. The scale is prepared with the numerals reversed since they are read through the telescope mounted directly above the scale and the mirror in the variometer housing.

nated scale, thus this instrument is similar to the mirror-galvanometer. The mirror and magnet used in our instrument is shown in *Fig. 1.*

Construction

Almost any type of magnet may be used. Even a horseshoe shape magnet is usable although the weight is more per unit of magnetic couple. The magnet should preferably be an old one so that it will not weaken by aging. The bar magnets from a telephone are particularly useful in this application. The magnet should have the dimensions ¼″ × ¼″ × 1¼″. The mirror is 1″ long and 5/8 inch high. It has a vertical hairline scratched in the reflector coating on the back in the center to provide a mark to be used in reading the scale. This hairline should be placed so that it is exactly on the turning axis of the suspended magnet.

The suspension consists of a bundle of glass fibers such as are used for weaving glass fabrics. The fiber bundles are separated by about 3/16 inch and the distance from the pulley to the coupling is six inches. When the instrument is first set up it will probably take several days for the glass fibers to reach their elastic stability and frequent readjustment of the torsion in the suspension will be necessary to bring the scale readings back to normal. Glass fibers must be used since they will be insensitive to changes in temperature or humidity. Metals are totally unsatisfactory for the suspension because they are subject to elastic fatigue.

The magnet and mirror suspension must be placed in a closed container which is non-magnetic. For this purpose we reached deep into our junk box and came up with the various parts to assemble the unit shown in *Fig. 2.* Many old-timers may recognize the base as the top of an old Western Electric horn-type loudspeaker. All materials that are used in building the instrument and its base should be carefully tested to be sure that they are non-magnetic. Just because the material is supposed to be brass or copper does not always signify that its impurities will not affect the magnet. Test each piece beforehand by bringing it near a freely suspended magnet and observing any deflection. The instrument housing has a small slot in the front to view the mirror. The base is adjustable for balance and a threaded shaft from the top may be rotated to counteract the magnetic pull of earth.

The suspended mirror and magnet should be located in a place where the earth's magnetic field is as undisturbed by surrounding objects as possible. By locating my own instrument in the basement of my home I was able to avoid the bad effects of temperature variations of the suspended magnet. These should also be avoided as the temperature will increase and decrease the strength of the magnet. Temperature compensation can be added to the variometer, but this is a complicated procedure and is not necessary if a reasonably constant temperature is maintained in the room.

After the variometer is placed on a rigid pier, a similar pier is necessary for the scale and the reading telescope. A sample of the type scale to be used is shown in *Fig. 3.* Actually, the scale should extend from 24 to 28 centimeters on either side of center. It should be accurately drawn on heavy white paper with India ink. It will be noted that the numerals are reversed due to the fact that the reflection of this scale will be read in the mirror of the variometer. The scale is located 176 centimeters from the mirror and at this range it will be necessary to use a small 3 or 4 power telescope directly above the scale. This is also shown in *Fig. 3.* It may be necessary to make a small peephole in the center of the eyepiece to limit

(*Continued on page 104*)

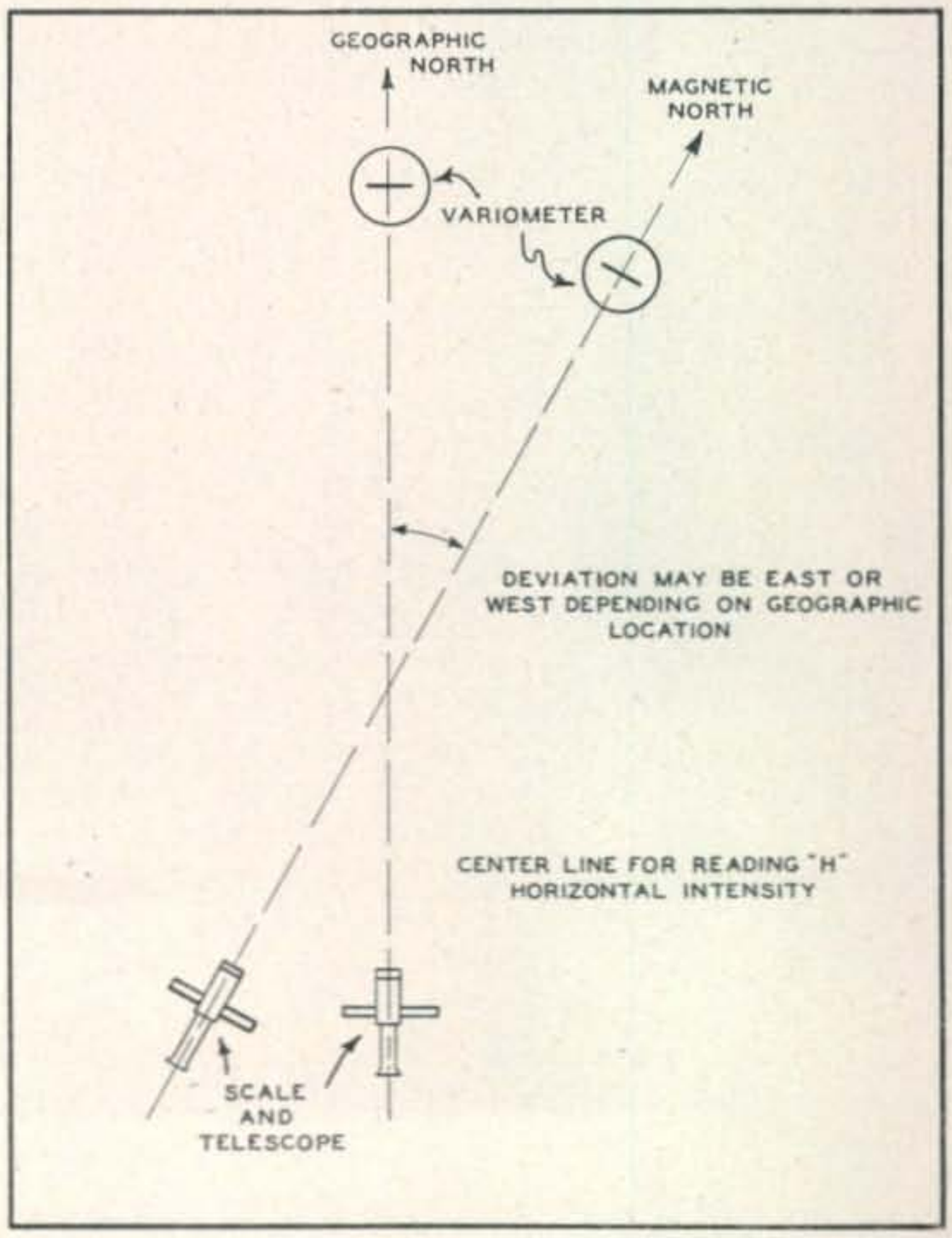


Fig. 4. The bar magnet of the variometer must be oriented to be perpendicular to the local magnetic meridian. Generally, this means that the instruments are set up with the help of isogonic maps and a sensitive compass.

◆ ◆

By utilizing existing holes, very little mechanical work is required on the front panel of the receiver.

◆ ◆

So I Bought a 348-Q

J. H. OWENS, W2FTW*

With some major surgery, that can nevertheless be handled by the average amateur, the performance of the 348-Q can be improved immeasurably.

YEP, I DUNNIT. On the recommendation of a certain editor of a certain radio magazine, I plunked down my dough and trudged home with 40 pounds of alleged radio receiver.

Sure, I've got a good radio receiver now, but the job of converting it was considerably more involved than what I had been lead to believe. The d.c. to a.c. changeover was easy enough—the printed instructions were complete, and they worked right off. The only change was to install a 10-μf, 50-volt electrolytic in the 6K6GT bias network directly across the .1-μf capacitor (63–2). This was done to reduce the hum picked up by the 6K6GT grid.

Then I got my first real look at what I had bought; a slightly used 348-Q having the following features:

1. Two stages of r.f. having questionable gain.
2. Three stages of wide band i.f. that let me hear too many stations at the same time on the crowded amateur bands.
3. A crystal filter that really suppressed signals, including the ones I wanted to hear.
4. An audio amplifier that delivered one watt of distorted power when the receiver was tuned to an overmodulated kilowatt next door.
5. A brightness control for the dial lamps (now ain't that wonderful!)
6. An audio volume control and r-f gain control on one shaft (a special feature for lazy hams!)
7. An unventilated cabinet that kept the set nice and warm so it wouldn't catch a cold.
8. Extra—one burned out antenna coil.

* *6931 Harvey, Merchantville, N. J.*

As Grandma used to say, "There's no use crying over spilled milk," so I gritted my teeth, cursed a bit, rolled up my sleeves, and went to work.

I-F Channel Selectivity

Sharpening up the pass-band involves using surgery on the i-f transformers. However, the operations are minor, and local anaesthesia is all that is necessary. The only precaution is to pull the a-c plug, and this is good practice right along until you discover all the odd places where hot wires are concealed.

The first step is to remove the shield can from the first i-f transformer. Then take a piece of push-back wire about 5″ long, and wrap it twice around the coil form, halfway in between the primary and secondary coils. Twist the ends together, solder them, and snip off the left-over pieces. The effect of the two shorted turns between primary and secondary is somewhat the same as a metal shield. It reduces the degree of coupling and sharpens the response curve.

Now put back the shield can, and realign the transformer. Tune the receiver to a spot where there are no signals; turn up the gain until you can hear background noise; put the crystal filter "in," and adjust the tuning slugs for highest sensitivity, which is found at the point of loudest background noise.

Repeat this operation on the second i-f transformer and then finish up with the third i-f transformer. Then go over all of the tuning adjustments as a final check. Now try the receiver again on the 75 and

20-meter 'phone bands, and you will find that the selectivity is materially improved. Alas and alack, you may also find that you have lost a bit of sensitivity, but don't let this worry you. Most of the loss is located several kilocycles from the center of the response envelope, and this is beneficial. Furthermore, when you have completed the conversion, the receiver will have more gain than it had when you started.

The Crystal Filter

As a crystal filter, this stage is a disappointment. Due to the fact that there is no means of varying the crystal selectivity or the phasing, the results obtained are of little practical use for amateur communications. Therefore this stage is eliminated completely. All associated parts connected to the 2nd i.f. (6SK7) are removed. Some of these crystal stage components are used later for a more practical purpose.

After eliminating the 2nd i-f stage, it's necessary to couple the first i-f tube to the 2nd i-f transformer.

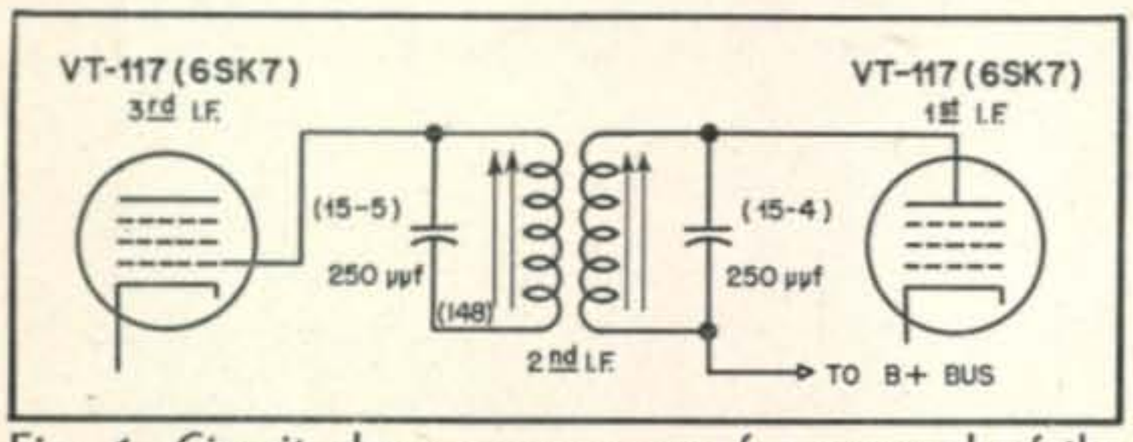


Fig. 1. Circuit changes necessary for removal of the crystal filter.

This is the simplest change made during conversion. Remove the 5000-ohm resistor (101–1) connected to the plate of the 1st i-f tube, and connect in its place the plate terminal of the 2nd i-f transformer.

The next step in the operation is to remove the crystal coil assembly, crystal switch, and the crystal intact. Then make sure the circuit is wired as shown in *Fig. 1*. Note that the 15,000-ohm resistor (99–1), the coil assembly (150), the 100-$\mu\mu$f coupling capacitor (34), the 35,000-ohm resistor (97–3) and the 5000-ohm resistor (101–2) have been removed.

After this change, realignment of the 1st and 2nd i-f transformers is necessary. At this point, again, don't be disappointed at the lack of receiver gain.

The Regenerative I-F Stage

The final i-f amplifier tube (VT-116) is made regenerative by soldering half-inch pieces of wire to its grid and plate socket terminals. When these wires are positioned about one-quarter inch apart, the tube will oscillate. The plan is to operate the tube below the oscillating level. By varying the degree of regeneration, the degree of selectivity and sensitivity can be controlled. When considerable regeneration is used, single-signal reception results.

The first step is to remove the VT-116 (6SJ7) and substitute the VT-117 (6SK7) from the crystal stage. A remote cutoff tube must be used because the sensitivity and regeneration are controlled by varying the grid bias. Now take the following steps:

1. Remove the connecting wire that goes from the cathode of the 6SK7 to the cathode of the VT-233 (6SR7). Ground the cathode of the 6SR7.

2. Remove the 6SR7 grid resistor (100,000-ohm) from the 6SK7 cathode and solder it to a ground point. Bypass the 6SK7 cathode to ground with a .1-μf capacitor at the socket.

Audio Volume Control (Second Detector 6SR7)

In order to get more audio, the following changes are made in the 2nd detector stage as shown in *Fig. 2*.

1. Disconnect the plate (red tracer) and grid (green tracer) leads of the c-w oscillator assembly from the 6SR7 2nd detector. Also disconnect the 35,000-ohm plate dropping resistor (97–1) from the plate socket pin. Leave its other end connected "as is" to the C.W. OSCILLATOR switch.

2. There is a 2-megohm resistor connected between the pin-5 diode and ground. Unsolder its ground end and run it over to the junction of the filter choke (155–B) and the 50-ohm resistor (108–2). This puts about 2½ volts of fixed bias on the diode and on the several grids in the a-v-c circuit.

3. Connect a 2-megohm resistor between the 6SR7 grid and the 2½-volt fixed bias point (see 2 above).

4. Connect a .01-μf capacitor between the arm of the volume control and the grid of the 6SR7 tube.

5. Install a 47,000-ohm, 1-watt resistor between the 6SR7 plate and the B+ terminal of the 3rd i-f transformer.

6. Connect the 1250-$\mu\mu$f 6K6GT grid coupling capacitor (25) to the 6SR7 plate.

With these changes the triode section of the 6SR7 is used as a 1st audio stage, which provides in itself a tremendous improvement in the over-all operation of the converted receiver.

The Beat Oscillator

Since the triode portion of the 6SR7 has been changed to the 1st audio, it is now necessary to make use of the eliminated 2nd i-f crystal stage for b.o. All wiring and parts associated with this stage were taken out with the exception of the filament wiring. This included the removal of wiring from the screen grid and cathode which were in parallel with the 1st i.f. (6SK7). The shell, cathode and suppressor are now connected together and tied to chassis ground. The plate and screen grid are tied together and go to the open end of the oscillator dropping resistor which was disconnected from the 6SR7 plate. It will be noticed that the plate voltage for the b.o. is obtained from the i-f screen grid in the original wiring. This circuit is retained but necessitates the wiring to be changed to the screen of the 1st i.f., thence to the same terminal on the fiber board on which the crystal filter coil was mounted. Wire the b.o. transformer to the new stage, putting the two wires on their respective lugs, green tracer to control grid and red tracer to plate. Black tracer can remain on the cathode of the 6SR7 as it is already grounded. Connect a 100,000-ohm ½-watt resistor (93–3) from grid to ground. This stage makes use of the 6SJ7 tube removed from the regenerative i.f.

Due to the fact the plate lug of the b.o. is close to the plate wire from the 1st i.f. (6SK7) to its respective transformer, enough capacity coupling will be found in most cases to give good c-w reception.

In any event it is not necessary to use more than one turn of pushback wire if extra coupling is used.

Delayed A. V. C. and Protective Bias

In the preceding instruction, the cathode of the 6SR7 was grounded, and fixed bias was put on its grid and on its a-v-c diode. Use was made of the source of negative voltage in the amount of 2.5 volts across the 50-ohm resistor (108–2) which provides bias for the number three grid in the VT-150 (6SA7) tube. The fixed bias on the a-v-c diode provides delayed a.v.c. because no current can flow through the diode until the peak voltage exceeds 2.5 volts. Therefore, very weak signals will receive full amplification because they will not actuate the biasing system.

Because the 2.5-volt delay bias appears on the grids of the two r-f amplifier tubes and the first and second i-f amplifier tubes, there is no need for additional protective cathode bias resistors (which reduce the over-all gain). Therefore, the 250-ohm r-f amplifier bias resistor (106) and the 400-ohm i-f amplifier bias resistor (113) should be removed from the circuit. The cathode bypass capacitors (65) .25 μf and (63–1) .1 μf can also be removed.

It is necessary to rewire the A.V.C.-M.V.C. switch at this point so that the negative 2.5 volts will appear on the tube grids when the switch is in the m-v-c position as well as the a-v-c position (see *Fig. 2*). In the a-v-c diode circuit are two resistors which form part of the filter network. The junction of the 300,000-ohm resistor (90) and the 15,000-ohm resistor (99–2) is connected to a terminal on the A.V.C.-M.V.C. switch. When the switch is in the m-v-c position, this terminal is grounded through a 100-ohm resistor (107–3). To keep protective bias on the tubes when operated with manual volume control, disconnect the 100-ohm resistor from ground and wire it to the negative 2.5-volt side of the 50-ohm resistor (108-2). Now the switch will short out all of the voltage developed by the a-v-c diode, and will also keep protective bias on the amplifier tubes.

Manual R-F Gain Control

Every good communications receiver should have a separate manual r-f gain control. This control is doubly important in a set that uses a regenerative i-f stage for variable selectivity. To illustrate the point, consider what is necessary for maximum selectivity. If the gain of the r-f and i-f amplifiers is reduced to a minimum, the major part of the receiver gain can be a function of the regenerative stage operating just below the point of oscillation where it will have a relatively narrow band width. Conversely, if broader band width reception is desired, the regenerative tube gain can be decreased and the i-f and r-f amplifier gain increased. Intermediate adjustment and balancing of the two will provide variable selectivity. Optimum signal-to-noise ratio will be at maximum r-f amplifier gain setting.

To install an r-f and i-f gain control, first remove the dial light dimming rheostat. It is no trick, and no loss either, to change the wiring for full voltage on the pilot lamps.

In the panel space left vacant by the dial lamp rheostat, install a 20,000-ohm wire-wound potentiometer. To one end of this pot, connect the cathode return leads from the two r-f tubes and the first i-f amplifier tube. Connect the arm to ground. Adjustment of the potentiometer will vary the negative grid voltage on the tubes and regulate their gain.

The manual r-f and i-f gain control should be wired so that the .25-μf capacitor (66) is connected between the hot end of the potentiometer and ground so as to eliminate any contact noise. Incidentally, this control will function when the panel switch is on m.v.c. or a.v.c.

The above described modification eliminates the function of the 20,000-ohm r-f section of the volume control (110) and the 80,000-ohm resistor (94–2) which was attached between it and the B supply line.

The Audio Volume Control

The changes so far described will allow the receiver to develop good room volume if the output transformer is properly matched to a loudspeaker. And this doesn't mean connecting the regular output transformer to the speaker voice coil. An intermediate matching transformer is necessary, but it can be almost any small output transformer. Try it on both the "LO" and "HI" positions, and make a

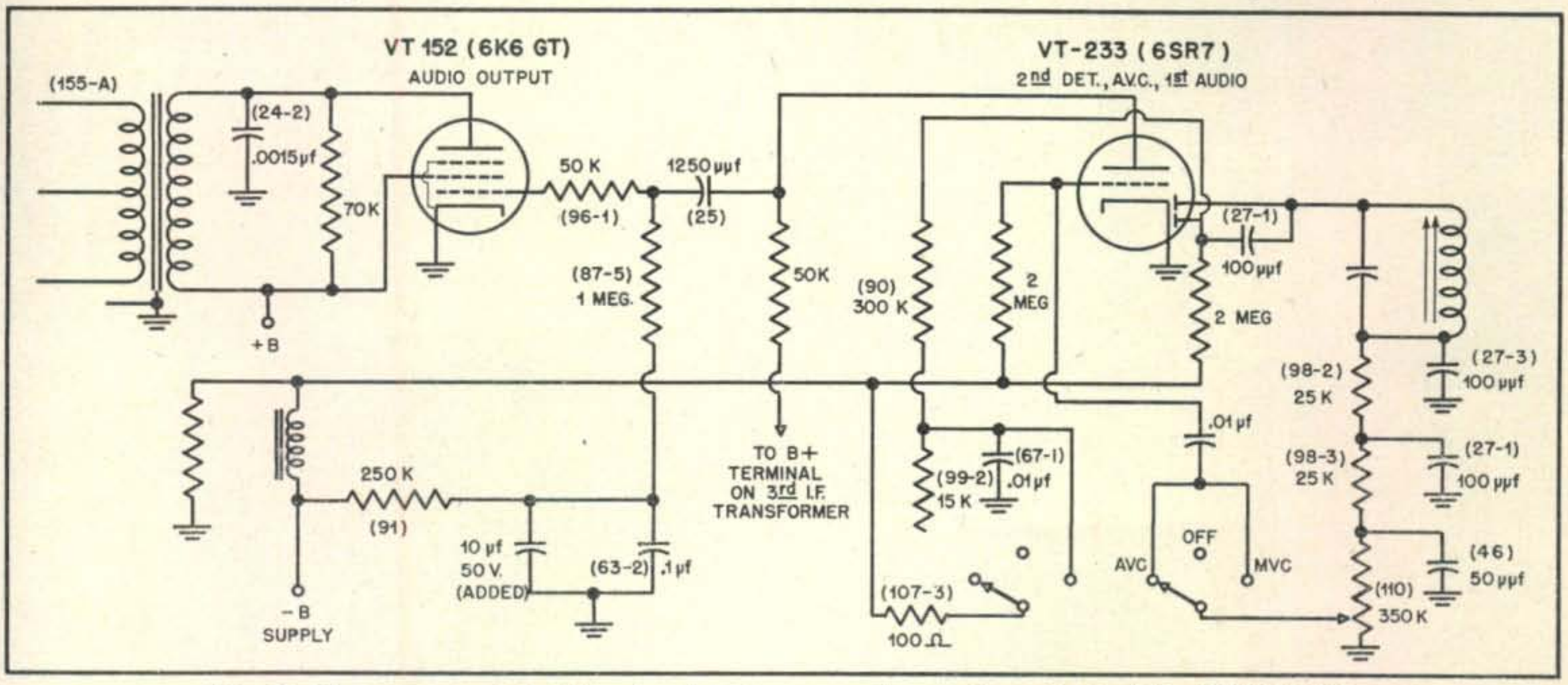


Fig. 2. Changes made in the circuit to increase the audio output of the BC 348-Q.

permanent connection to the one that gives the greatest output.

And while you're working on the audio end, make a useful change in the phone jacks. Eliminate one of them. Yes, take it out, and in its place put a toggle switch. Connect the switch in series with the power transformer primary.

Due to the high gain of the receiver at this time it is best to connect the remaining headphone jack to the LO position on the output transformer. There is more than enough volume in this position. The male plug located at the bottom rear of the receiver is removed and provides space for the new output transformer. A UTC 38 A fits nicely.

Upon removal of this plug rejoin the two white wires along with the bypass condenser, also the two brown tracer wires. Filament wiring can be taken out of the circuit.

A.V.C.-M.V.C. and the Screen Grids

The screen grid circuit controls to some extent the size of the r-f signal that the receiver will handle. For the widest control latitude, the screen grid voltage should have poor regulation. This can be accomplished by feeding the screen grids through a series resistor from the plate supply, without any bleeder resistors.

To start this modification, connect the first r-f tube as a pentode instead of a triode. To do this, simply disconnect its screen from its plate, and then wire it over in parallel with the screen of the second r-f amplifier tube. Next, remove the 100,000-ohm feeder resistor (93–4) and the one-megohm parallel bleeder resistor (87–3). On this same circuit is connected the wire that feeds the screen grids of the first and second i-f amplifier tubes. Follow this circuit through and remove the 35,000-ohm series resistor (97–2) and the one-megohm bleeder resistor (87–4). Now the first and second r-f and i-f amplifier tube screen grids are all connected in parallel, and they can all be fed through a single one-watt 30,000-ohm carbon resistor.

Two sections of the A.V.C.-M.V.C. switch were originally provided to handle the battery current to the dynamotor. This wiring is no longer necessary and should be removed. Then one of these switch sections can be wired to handle the screen grid voltage supply to the r-f and i-f amplifier tubes. If this is done properly, the A.V.C.-M.V.C switch will remove the screen grid voltage from the tubes when in the "off" position, which can be used for a "transmit" position in lieu of a send-receiver switch.

The First R-F Amplifier

Contrary to popular belief, connecting the first r-f amplifier as a pentode instead of a triode will not increase the gain. The reason is that the gain is related to the plate load impedance, which in this circuit is limited by the plate load, distributed capacity and 15,000-ohm plate resistor (99–3) and the transconductance. A tube triode connected has higher gm than the same tube pentode connected. Nevertheless, the change to pentode connections was made in a prior circuit modification because it improves the m-v-c and a-v-c action.

Perhaps the most effective improvement is one that will allow the antenna coil to be tuned with the

(*Continued on page 108*)

Emergency Capacitor

AN EMERGENCY high-voltage capacitor suitable for radio and electronic use may be made from two glass containers (such as tumblers, jars, or test tubes), one placed inside the other and both filled up to the same level with ordinary tap water. One bare wire lead is dipped into the water in one container, and a second similar lead is dipped into the water in the other container.

The water capacitor consists of two glass containers, one suspended inside the other, both filled with water. Bare wire leads immersed in the solution of each container act as the conductors.

Details of such a capacitor are shown in the accompanying photograph. The voltage that the capacitor will stand depends mainly upon the wall thickness of the inner container. The thicker the wall, the higher the breakdown voltage.

The capacitance of the unit depends upon the height of the water and the inside diameter of the inner container, as well as upon the wall thickness of the inner container and, to some extent, upon the grade of glass. For a high capacitance, use large jars, each filled within an inch of its top.

Following is the capacitance value obtained for the water capacitor shown in the photograph. This one, made by standing a 7/8"-diameter chemical test tube in a tall pickle jar and filling each with water to a height of 4", gave a measured capacitance of 300 $\mu\mu$f. A second unit, made by setting a small water glass inside a regular-sized tumbler and filling each with water to a height of 2½", gave a measured capacitance of 150 $\mu\mu$f. Voltage breakdown in each case is several thousand volts d.c.

The higher the water level, the larger the diameter of the inner container, and the thinner the wall of the latter, the higher will be the capacitance obtained. Larger containers will, of course, give higher capacitances. Also, several small water capacitors may be connected in parallel to obtain a high capacitance value. —*W1AY*

Inside the SHACK AND WORKSHOP

Conducted by A. DAVID MIDDELTON, W1CA*

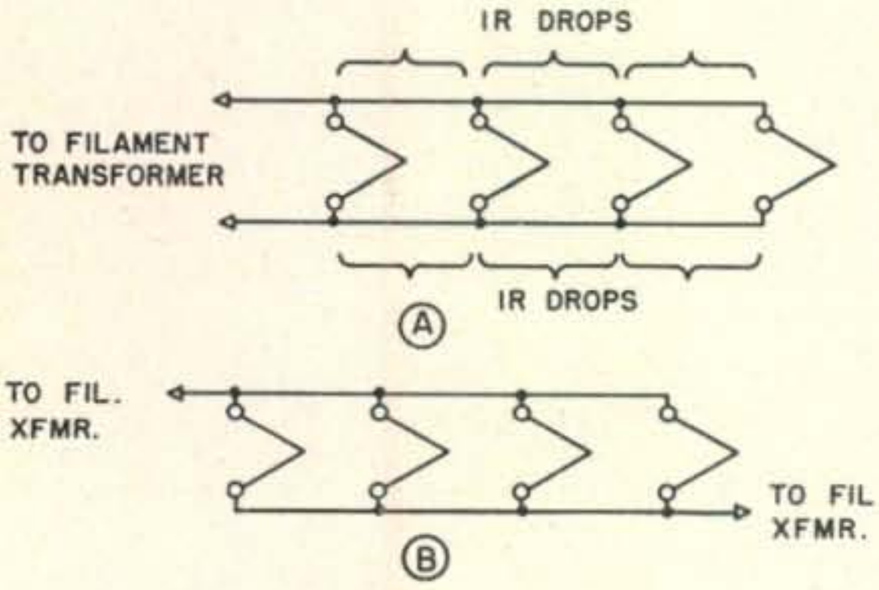
A-C Relay Hum

Here is a trick I tried on the humming a-c relays in my transmitter some time ago and they have been silent ever since. By sticking a piece of cellulose Scotch tape on the *end* of the relay magnet I found that it would keep the relays from humming and chattering. The arm of the relay rests on the tape instead of against the magnet.

Joe J. Pryor, W5MJD

Equalizing Filament Voltage on High-Current Tubes

Tube manufacturers recommend that filament voltages be kept at rated values to insure best performance and long tube life. When using two or more tubes in parallel, the filaments are generally connected as shown in *A*. The first tube will have *higher* filament voltage because of the IR drop along each of the two wires between the tubes. The



amount of this drop, of course, depends upon wire size, and filament amperage. While in most cases this unequal voltage might be negligible, nevertheless some amateurs might be interested in overcoming this condition, particularly in instances where high current tubes at low voltages are involved, such as 866s. *B* shows how this can easily be done, so that each tube will have the same voltage, regardless of how many are used.

Ray Rosenberg, W3NCJ

Non-Skid Screwdriver

Did you ever try to get a screw loosened and the screw driver slipped in your hand every time you turned it? A simple remedy is to wrap a rubber band around the handle of the screwdriver. This will make it "slip proof."

Pat Crofts, Dallas, Texas

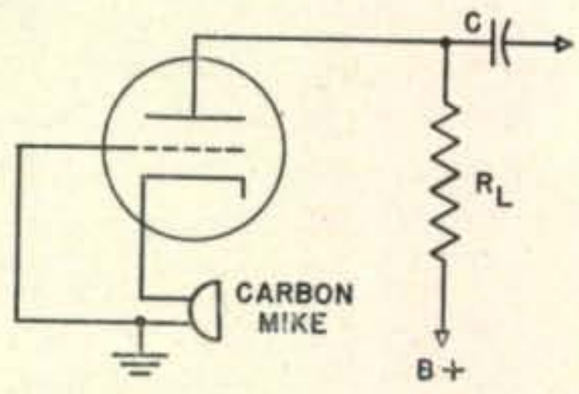
Eliminating Hum in Microphone Amplifier

The ideal spot to place the grid loading resistor on the first stage of a speech amplifier is right on the mike head. This placement eliminates resistor problems and really does the trick in licking that irritating hum problem. If hum still persists, use a tube with a top grid (such as a 6J7 or 6F5) instead of one with the grid coming out of the bottom in close proximity with the a-c heater leads.

C. H. Gustafson, W6CXE

Carbon Microphone Without "Mike" Transformer

A method of connection of a 200-ohm carbon microphone to a triode tube, without using microphone transformer and without the use of microphone batteries, is shown in the figure below.

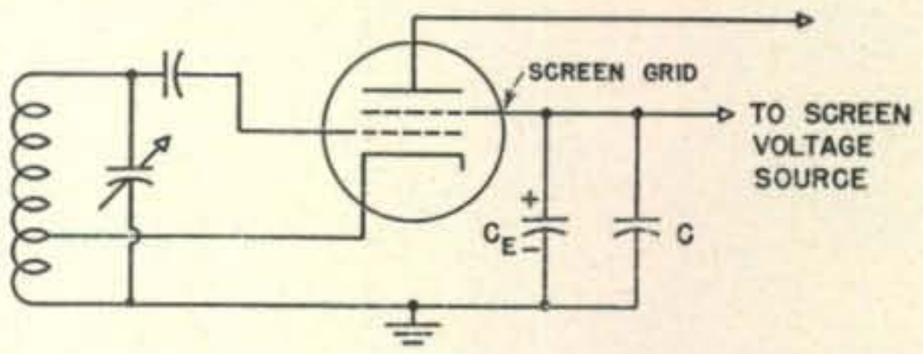


Modulation of the cathode current is obtained through resistance changes of the carbon pack in the microphone button. Due to the extremely low grid impedance hum pickup is negligible.

W. R. Pearce, ex-W1GKH

Screen Voltage Stabilization on Oscillators

Since the frequency stability of electron-coupled oscillators depends primarily upon the regulation of the screen voltage, it is common practice to employ a regulator tube for voltage stabilization purposes. In some cases, however, space or other considerations prevent the use of regulator tubes, and in such instances fairly effective regulation can be obtained by connecting a high-capacity electrolytic capacitor directly across the screen grid connection and ground. The polarity of the condenser should be observed. A 16 or 20-μf electrolytic condenser connected as shown in the diagram will provide a slow-time constant which will "cushion" or smooth out rapid fluctuations in the applied screen voltage. In general, the exact value of capacity required is not critical and will vary with the current drain of the



oscillator, larger capacities being required for higher current drains. The regular screen bypass capacitor should be left in the circuit for r-f bypassing because electrolytics themselves are ineffective for this purpose.

This scheme *cannot* be used with keyed e.c.o.s since the charge and discharge of the electrolytic capacitor will produce a decided "yoop."

Jack Najork, W2HNH

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

The Amateur Newcomer

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

Radio-frequency power amplifiers

ORDINARILY THE radio-frequency oscillator is used only as a source of a small amount of power of relatively high frequency stability, designed to start oscillating reliably each time power is applied. The latter point is of concern only when the oscillator is heavily loaded by excessive coupling to an antenna or to a following amplifier.

As noted earlier, a portion of the plate power of an oscillator is fed back into the grid circuit in order to supply the losses in the "input" and thus enable oscillation to be maintained. If, however, the oscillator is called upon to deliver an excessive amount of power to its load, i.e., is heavily loaded, there may not be enough power available to supply both the oscillator grid losses and the demands of the load. When this occurs the oscillator stops oscillating, or, more usually, refuses to start again after having been stopped, as in keying.

Since the oscillator itself is limited in its output, when the necessity for high power arises the addition of amplifier stages is required to bring the final output to the desired level. Such amplifiers may operate on the same frequency as the oscillator, or they may operate on harmonics of this frequency, so as to bring the final output to some integral multiple of the original frequency.

Final and Buffer Amplifiers

Amplifiers operating on the same frequency as the oscillator are generally termed simply "amplifier" or, more definitively, "buffer amplifiers" or "final amplifiers," depending on their position in the overall transmitter circuit. A final amplifier is the last stage of a transmitter—that stage which is coupled to the antenna. A buffer amplifier is an intermediate amplifier, inserted between the oscillator and the final amplifier.

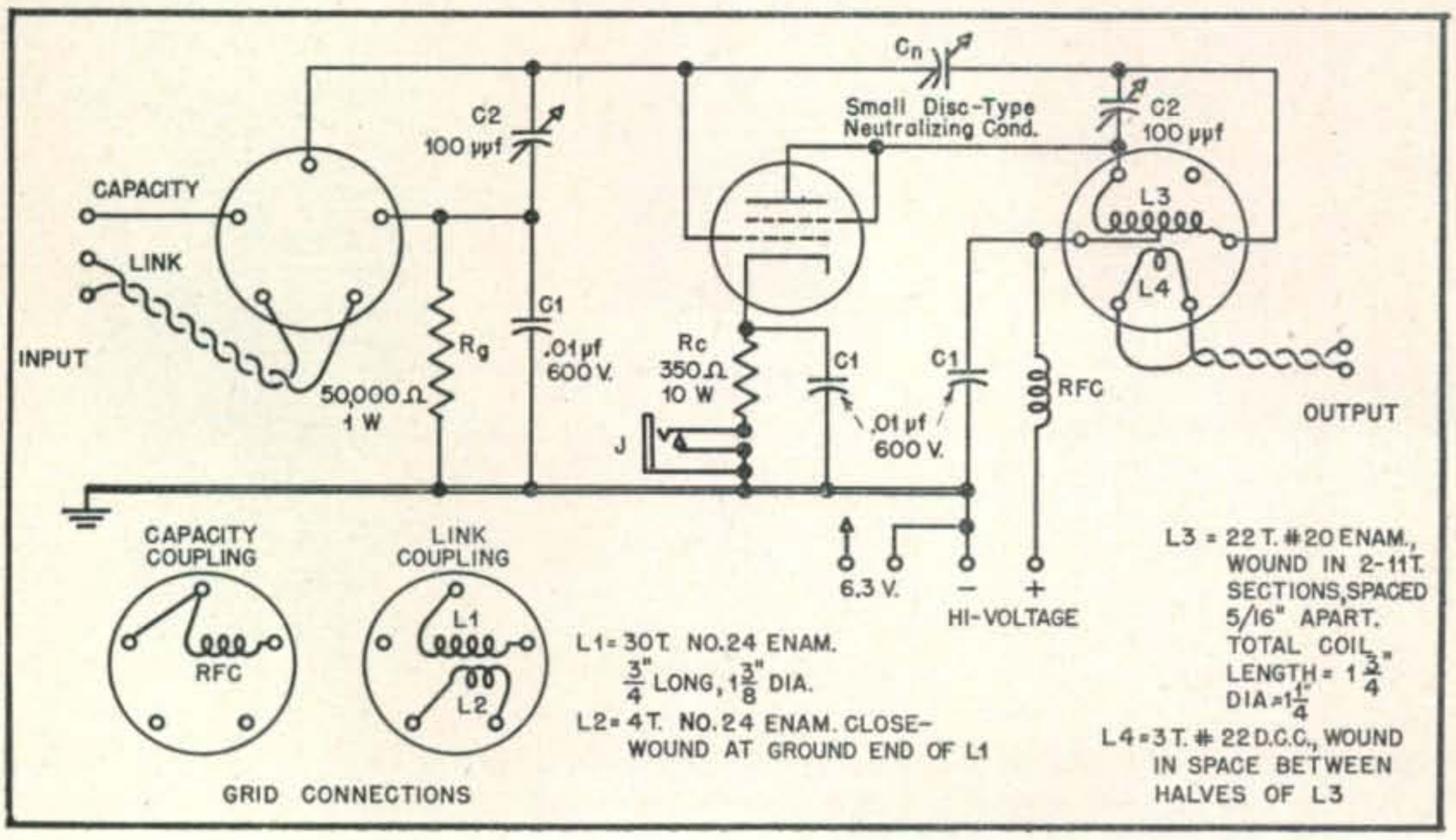
It may be necessary to employ a final amplifier which demands several times the amount of grid drive the oscillator is capable of furnishing. In this case a single buffer amplifier is inserted. A tube is chosen which can operate well on the amount of drive which the oscillator can furnish, yet which will supply the final amplifier tube with all the grid drive it requires.

Again, the oscillator may be just barely capable of driving the final amplifier. The excitation to the final is adequate, but minor changes in loading of the final produce some change in the frequency stability of the oscillator. In this case a buffer may be inserted to isolate the oscillator from the final. Such a buffer "loafs along" at a fraction of its rated input power, serving as an isolation device.

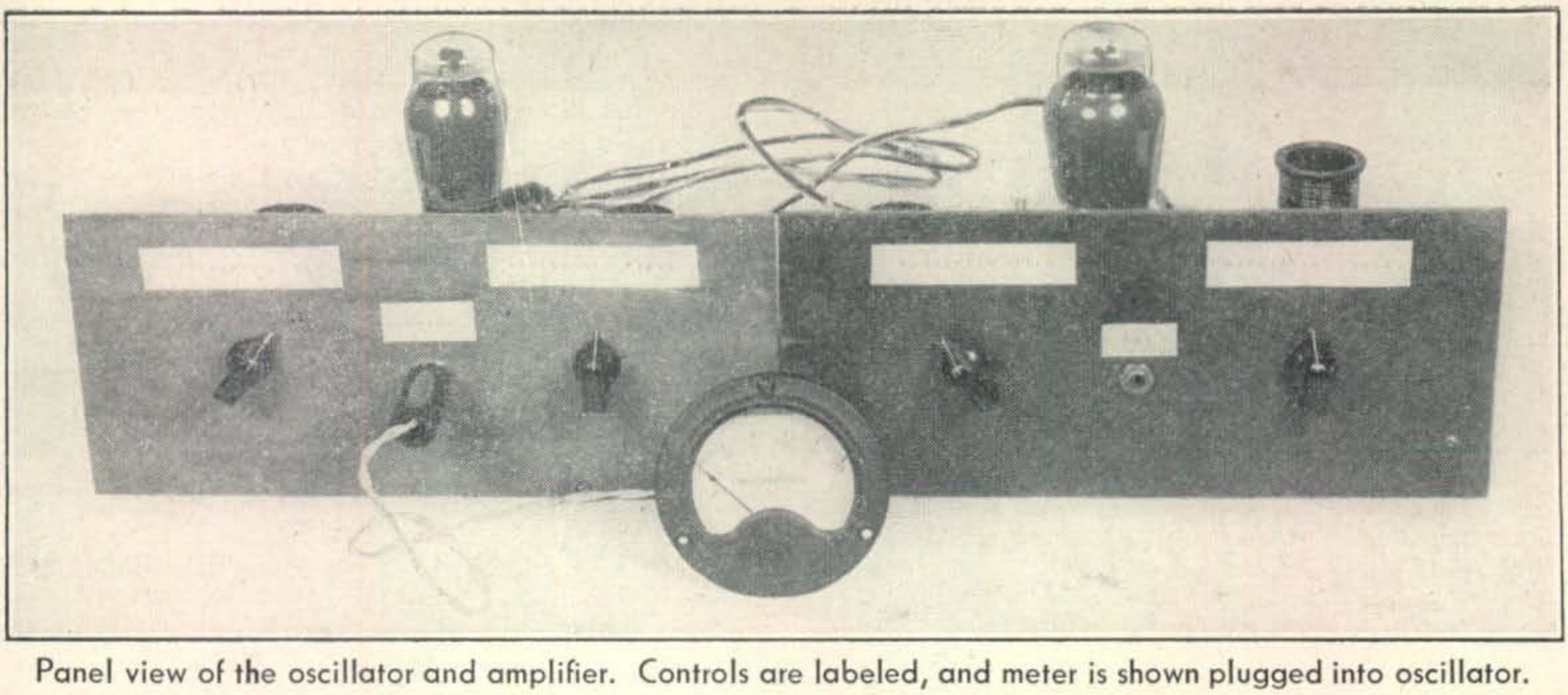
If the oscillator is capable of producing many times the amount of power required to drive the amplifier, it is usually not necessary to employ a buffer. This is often the case with modern beam-power tetrodes, and with transmitting pentodes. These tubes take but an infinitesimal amount of driving power, and hence may usually be driven by a low-powered oscillator. If, however, the amplifier takes most or all of the oscillator's output to drive it, then a buffer amplifier should be interposed.

Frequency Multipliers

An amplifier that provides output on a frequency which is a multiple of the frequency impressed on its grid is termed a frequency multiplier. If the harmonic in question is the second, the amplifier is a doubler; if the third, a tripler, and so forth.



Circuit diagram of the experimental radio-frequency amplifier using a 6L6 beam power tetrode.



Panel view of the oscillator and amplifier. Controls are labeled, and meter is shown plugged into oscillator.

Often a frequency multiplier is not expected to supply appreciably more output than the lower frequency input power supplied to its grid. Its function is restricted to that of changing the operating frequency to some multiple of that of the driving source. To operate in the amateur 10-meter band, for example, many operators make use of 40-meter crystals. A 7-mc crystal may be used to double to 14 mc in one stage and a second multiplier doubles again to 28 mc. Thus the original frequency is 7 mc, while the final output is on 28 mc.

When a frequency multiplier does not appreciably increase the available driving power, it may be followed by a buffer amplifier, operating on the same frequency as the final amplifier and used only to increase the available power at the desired output frequency until there is sufficient to drive the higher-powered final.

This is particularly true if the frequency multiplier is used to triple or quadruple the original frequency. The efficiency of a straight amplifier is relatively high, because most of the output of an amplifier is on its fundamental frequency. That is, of the amount of d.c. plate power applied externally to an amplifier, as much as 75% may be available as useful output. If the amplifier is operated as a multiplier, however, the efficiency drops off greatly, because the waveform generated does not contain as great an amount of harmonic output as it does of fundamental-frequency output. As the multiple of the original frequency is increased, the efficiency drops off still more, so that often an inordinate amount of power must be supplied externally in order to get the desired output from the stage. In such cases the solution is to use one or more extra multiplier stages.

In the planning and construction of a radio transmitter, the builder must decide the frequencies on which he wishes to operate, as well as the original signal frequency, and what intermediate amplifiers are necessary to multiply the original frequency to the desired output frequency and still supply enough power to excite the final adequately.

As mentioned above, however, modern beam-power tetrodes are so sensitive that many of these apparent difficulties are obviated. Thus it may be possible to multiply the original frequency several times in one amplifier stage, or even in the oscillator itself, and still supply an adequate amount of drive to the final.

The Experimental Amplifier

In order to demonstrate the operation of a radio-frequency amplifier, an experimental unit was constructed along lines similar to those of the oscillator described in the preceding article of this series. It is diagrammed in *Fig. 1*, and shown in the photographs.

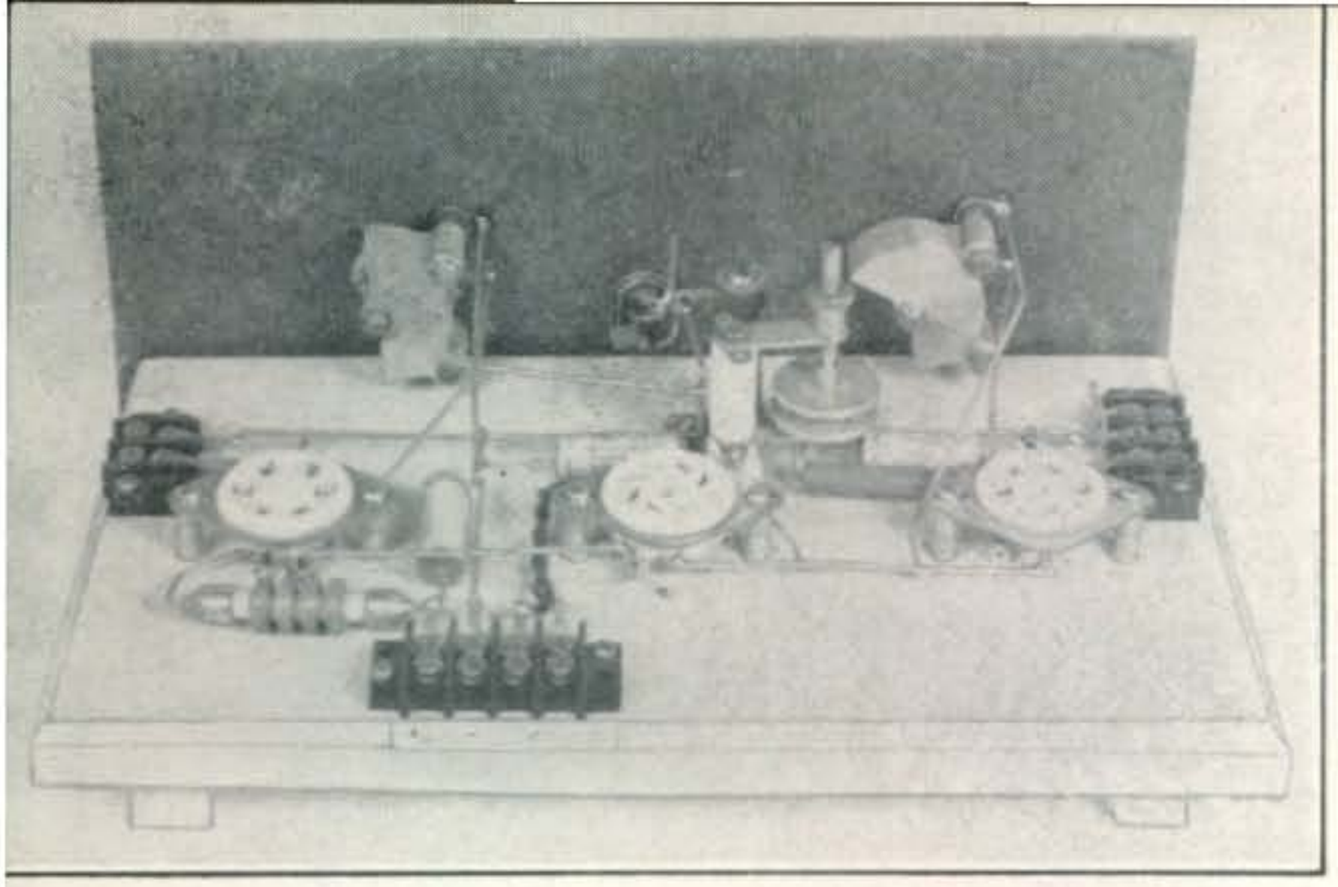
The amplifier employs "breadboard" construction. The board is a piece of soft wood, 6″ x 11″. It has two cleats on the bottom to hold it off the operating table, and is faced with a 6″ x 11″ panel of ⅛″ tempered Masonite.

Three ceramic sockets are spaced along the center of the board. Left to right, these are for the grid coil, the tube, and the plate coil. The two tuning condensers are mounted on the panel just in front of their respective coil sockets. The panel also holds a closed-circuit jack which is wired in the tube cathode circuit so that a meter or panel lamp may be plugged in to measure the cathode current.

Terminal strips are used for external leads. At the left a three-terminal strip brings in excitation from the oscillator. Either link or capacity coupling may be employed. At the right a two-terminal strip brings out the output link windings from the plate coil. At the rear of the board there is a four-terminal strip for connection to the power supply.

A piece of wire extends from one terminal of the input link to one terminal of the output link, and is used as a common connection for all grounded components. This wire is No. 14 tinned copper wire, known as "bus-bar"; virtually all wiring is done with this type of wire. The exceptions are the two sets of twisted leads to the link windings on the coils, and the filament leads, which are also twisted. All connections are, of course, soldered.

A five-prong socket is used for the grid coil, a six-prong socket for the plate coil and the 6L6G tube employs an octal socket. Directly in front of the



Rear view of amplifier chassis. Neutralizing condenser may be plainly seen. Cathode resistor is behind neutralizer, but top is visible. Common ground lead may be seen running from center terminal of input to panelward terminal of output.

tube socket are the cathode-bias resistor and the neutralizing condenser.

The cathode-bias resistor is a 10-watt (350 ohms) wire-wound resistor. It is mounted by means of a 2-inch 6–32 machine screw passed through the ceramic tube of the resistor. In this case a hole was drilled into the baseboard slightly smaller in diameter than the screw, the screw cutting its own threads as it was driven into the hole.

The neutralizing condenser consists of two pillar insulators, mounted one on top of the other, and holding a pair of disc-type plates, one of which may be adjusted with respect to the other. It may be seen just to one side of the tube. The purpose of both these components will be described later.

All components mounted on the baseboard are fastened by means of short round-head wood screws. The socket is held off the board by means of aluminum bushings about 1" long so as to clear the terminals. Soldering lugs were used on the terminal strips. The paper bypass condensers, the grid leak (R_g), and the radio-frequency choke in the plate circuit are all held in place by having their wire leads soldered firmly to the terminals to which they connect. The tuning condensers and the metering jack are held to the panel by means of the threaded bushings which are integral with their construction, and the panel is fastened to the baseboard by means of wood screws.

As pointed out in the preceding article, this type of construction is only desirable in a piece of demonstration equipment. It does not provide for short leads, which are always to be sought, nor does it take advantage of the shielding inherent in a metal chassis. It operates, however, and the writers have seen many rigs constructed in exactly the same manner.

The grid-circuit coils may be wound on tube bases secured from the junk box, or from the neighborhood serviceman. The plate coils are wound on standard 1¼" diameter six-prong coil forms. Since the grid circuit has relatively little circulating current flowing, the forms and wire for the coil may be smaller without undue loss. In the plate circuit, however, the current may reach some magnitude; hence, a larger form and larger wire should be used. In some high-powered transmitters, coils may be wound of copper tubing of fairly large diameter.

Method of Operation

The fundamentals of amplifier operation, once understood, may be applied to units of any size or method of construction. They hold true regardless of whether the amplifier employs triode, tetrode, or pentode vacuum tubes. The sole differences are those which come about as the result or variations in the amount of drive required, in the interelectrode capacities, and in the addition of such tube elements as the screen grid or suppressor grid.

Since all tubes commonly employed by amateurs have the same elements, it is well to review them at this time so as to demonstrate their relative voltages or potentials. The tube has a cathode which may be directly heated by a flow of current through the cathode itself, or indirectly heated by means of a flow of current through a filament so placed as to enable it to heat the cathode. Usually the directly heated element is termed the filament, and the indirectly heated element the cathode. They are identical in that they serve, when heated, as a source of electrons.

The control grid ("grid") is the element which exercises control on the flow of electrons within the tube by virtue of the fact that its potential may be varied from a point more positive than that of the cathode, at which point much space current flows, to a point less positive (more negative) than that of the cathode, at which point relatively little current flows. The grid has great effect upon plate-current flow, achieving this variation with relatively little potential difference of its own.

Ordinarily, when used as a radio-frequency amplifier, the vacuum tube is operated under what are known as "Class C" conditions. That is, the grid is kept at a relatively high negative voltage—at least twice as high as that necessary to stop completely the flow of plate current.

The plate is the element which introduces outside power to the vacuum tube, and from which power is drawn in the form of radio-frequency output. Ordinarily it is maintained at a potential which is greatly positive with respect to the cathode, and even more positive with respect to the grid. This potential may be as high as several thousand volts, and the power supply maintaining this potential must be capable of supplying a considerable amount of current.

In order to achieve certain characteristics, other elements are often introduced. A screen grid is advantageous in that it reduces the interelectrode capacity between control grid and plate. The screen potential is more positive than that of the cathode, but less positive than that of the plate. Its potential has a marked effect upon the amount of plate current flow, and hence on the power output of the tube. Often a difference of a small amount in the screen potential may make a considerable difference in the plate current.

The only other commonly found element is the suppressor grid, employed to prevent secondary emission. Transmitting pentodes have largely been replaced by beam-power tetrodes, however, in which the suppressor is replaced by special tube geometry.

Bias

The foregoing is included because the matter of relative potentials is one which puzzles many amateurs. The metal chassis of the amplifier is at zero (ground) potential so far as the power supply is concerned, *but the chassis and the tube cathode are not necessarily at the same potential.*

If we examine *Fig. 2*, we note that point *A* is at a potential (voltage) as great as can be delivered by the power supply. The plate of the tube is at the same potential. At the same time the grounded chassis, represented by the double horizontal line, is at zero potential so far as the power supply is concerned, being connected to the negative terminal of the supply.

Between the tube cathode and the grounded chassis a resistor may be connected. In this case, the tube space current flows through the cathode resistor, with the result that, by Ohm's Law, point *C* will be found to be less positive (more negative) than point *B*. In other words, the cathode is positive with respect to the chassis ground.

In the grid circuit, R_1 is seen to be connected in series with the coil between the grid and chassis ground. On excitation peaks, grid current will flow; hence there will be a voltage drop across R_1, making point *D* (the tube grid) negative with respect to the chassis. Since the chassis is negative with respect to the cathode, it follows that the grid is negative with respect to the cathode by an amount equal to the voltage drop across R_1 plus the drop across R_2.

The experimental power amplifier is essentially the same as the tuned-plate tuned-grid oscillator described in the foregoing article, so far as the basic circuit elements are concerned. The great difference is that it is so adjusted as to make it impossible to oscillate by itself, and hence its grid losses must be supplied from a preceding oscillator. That is, it must have excitation.

If sufficient power output is available from the oscillator, and the excitation requirements of the amplifier are low enough, the grid coil and condenser, which serve to "peak up" the excitation, may be dispensed with, and the two units coupled by means of a condenser between the plate of the oscillator and the grid of the amplifier. Such a condenser was provided in the oscillator, and hence is not included in the amplifier. *Fig. 3* illustrates schematically these two methods of coupling. Note that in either case a resistor is interposed between grid and ground. In *Fig. 3A* it is between the bottom of the coil and the chassis ground; in *Fig. 3B* it is between an r-f choke and chassis ground.

The grid resistor in conjunction with the grid condenser serves the important function of keeping the tube grid negative with respect to the cathode during most of the r-f cycle. It is important to remember that they only perform this function when the tube is being excited sufficiently to cause grid current to flow. Under these conditions the voltage drop across the resistor develops a negative grid potential and charges the condenser to this potential, thus tending to limit plate-current flow. If excitation were to fail with plate voltage applied, the grid would no longer have its negative potential and the plate current would become excessive, perhaps to the point of damaging the tube.

To prevent this disastrous eventuality, protective bias may be used. This is often in the form of a battery or other power source connected with its positive terminal at chassis ground potential and its negative terminal toward the grid as illustrated in *Fig. 4A*.

Figure 4B shows how some degree of protective bias may be obtained through the use of a cathode resistor, as is done in the experimental amplifier. This method operates by virtue of the fact that all space current in the tube flows through the cathode resistor.

By Ohm's Law, if a current is passed through a resistance of any given value, the voltage drop across this resistor will vary with the amount of current, becoming greater as the current becomes greater, and vice versa. As pointed out earlier, if excitation fails, there is no grid bias, and a great amount of plate current flows. As this plate-current flow increases, however, the drop across the cathode resistor increases, and the cathode becomes more positive with respect to chassis ground. Since, under these conditions of no grid current flow, the chassis ground is at the same potential as the grid, it follows that the grid potential is thus made more nega-

(*Continued on page 104*)

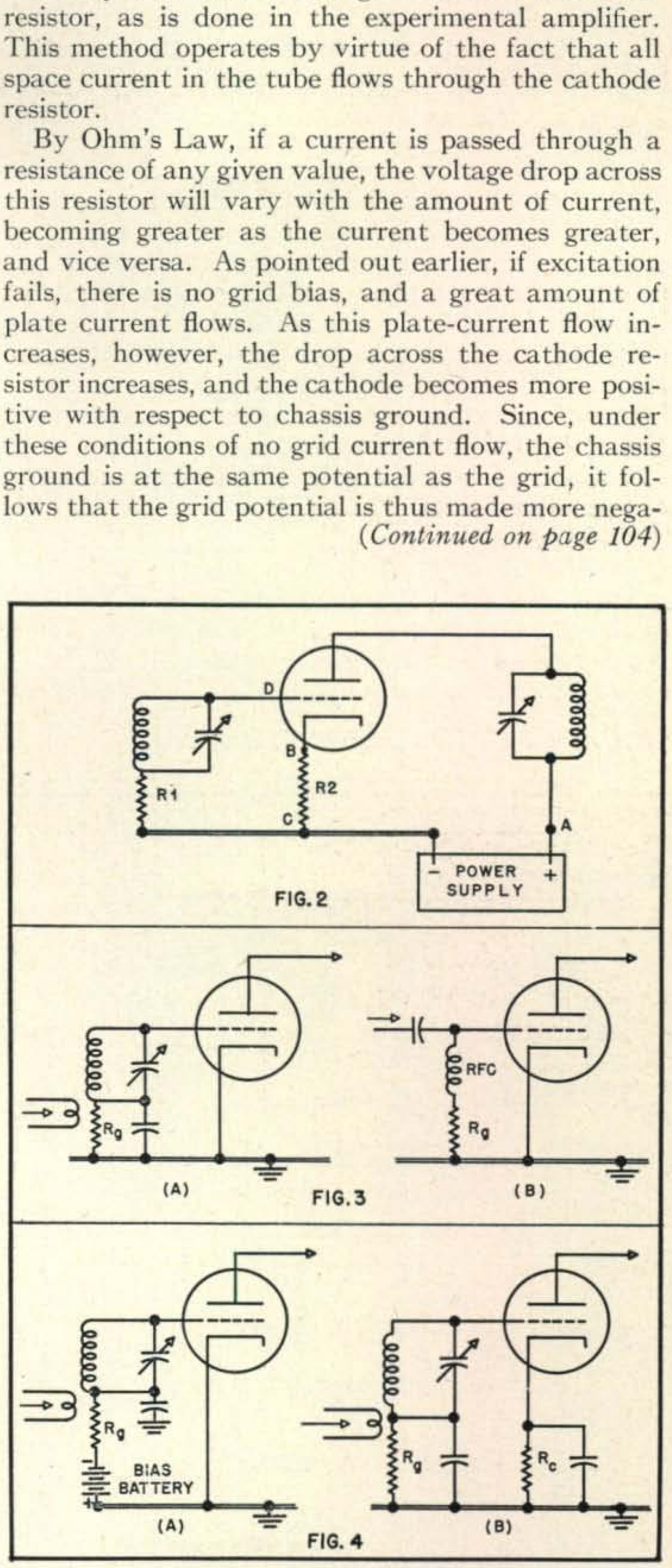


Fig. 2. Simplified basic amplifier circuit. Fig. 3. Two methods of coupling excitation to an r-f amplifier. Fig. 4. Two methods of obtaining protective bias for the r-f amplifier.

A Shunt-Fed 1-kw Final

RUFUS P. TURNER, W1AY*

A conservative approach to high-power design incorporating triode amplifiers for maximum stability of operation.

THE HIGH-POWERED push-pull Class-C amplifier described in this article is typical of the units which may be built around a pair of 250TH or similar tubes. While relatively conventional in layout, it incorporates shunt feed in the plate circuit, the many advantages of which have been insufficiently publicized in amateur literature. Perhaps even more important, it represents a conservative approach to high-power design which will give years of trouble-free service without any attention except an occasional dusting.

Advantages of Shunt Feed

Most amateurs use some variation of series feed in the plate circuits of their final amplifiers. One popular series-fed arrangement is shown in *Fig. 1A*. Series-fed circuits are simple but they have the pronounced disadvantage that the positive high voltage appears on the tuning capacitor and tank coil, and on the neutralizing capacitors. This makes coil changing and neutralizing a risky business, and necessitates use of an insulating coupling between the tuning capacitor shaft and tuning dial. Also, plate spacing in the tuning capacitor must be wide enough to withstand both the r.f. and d.c. In a high-powered modulated amplifier employing series feed, this calls for a large, expensive tuning capacitor.

In the shunt-fed circuit (see *Fig. 1B*), high d-c voltage is applied to the tube plates through a pair of r-f chokes. The blocking capacitors, C_1 and C_2, then isolate the tank coil, tuning capacitor, and neutralizing capacitors from the d. c., while affording relatively easy passage to r-f currents. Plate spacing in the tuning capacitor used in the shunt-fed amplifier need be no greater than that required for c. w. This results in a considerable saving of both space and money. Neutralizing capacitors are less susceptible to flashover, and attendant damage to high-voltage power supply and plate milliammeter is prevented.

Heretofore, more amateurs have not employed shunt feed undoubtedly because of the inefficiency of the usual run of r-f chokes in this type of circuit. However, The National Company developed a special choke, some time ago, expressly for shunt-fed finals, and this component is readily obtained.

By removing high d-c voltages from the tank coil and capacitor, shunt feed greatly reduces the hazard of high-powered transmitters.

*P.O. Box 345, New Bedford, Mass.

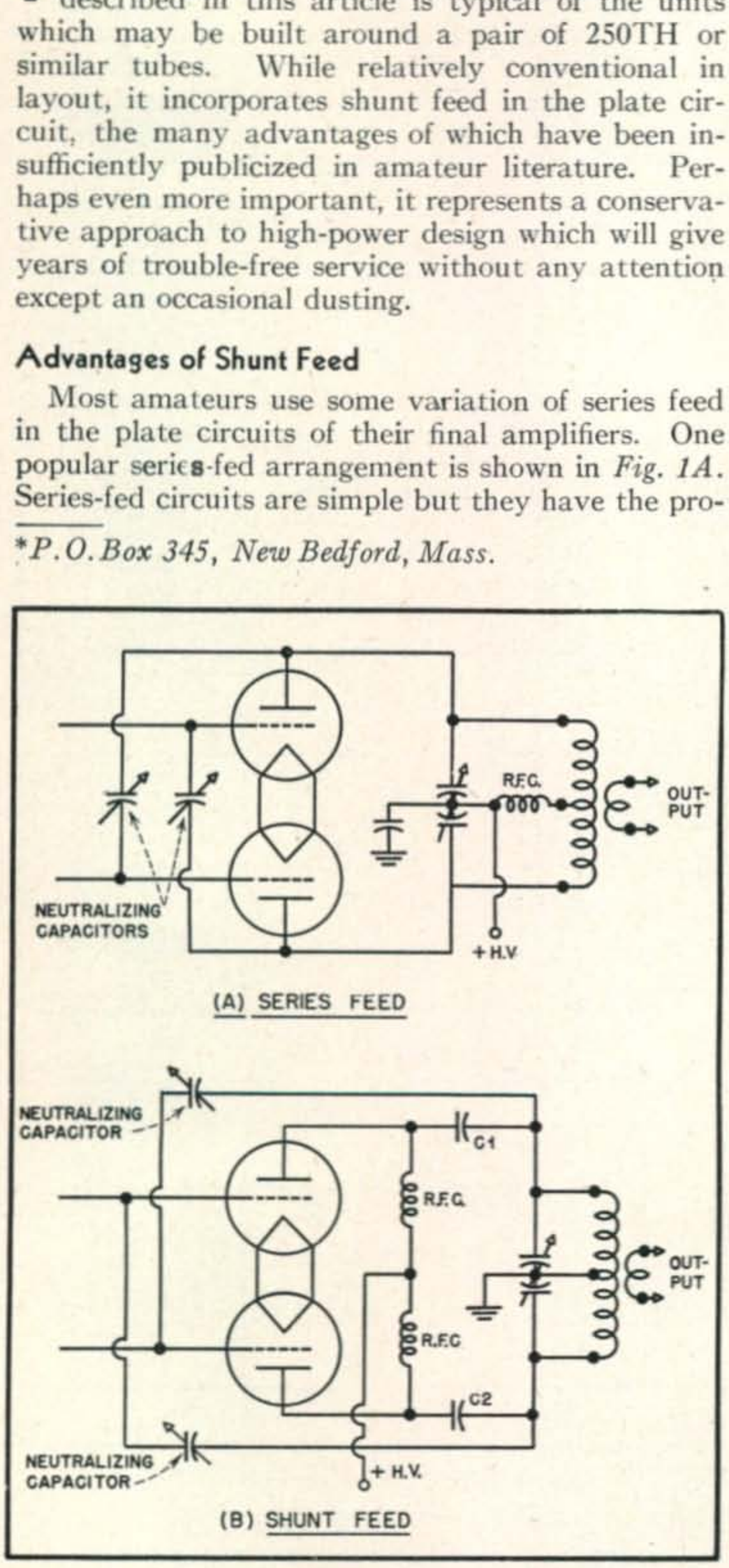


Fig. 1. A-Conventional series-fed final amplifier. B-The series-fed circuit modified for shunt feed.

Amplifier Circuit

The complete amplifier circuit is given in *Fig. 2*. Various views of the completed unit appear in the photographs.

For simplicity and compactness, plug-in coils are employed in both grid and plate circuits. These coils may be factory-made or may be wound at home according to the winding directions appearing in the amateur handbooks.

The grid circuit is arranged for partial bias by grid resistor action. If the reader prefers, however, grid resistor R may be dispensed with, and all of the grid voltage obtained from the external bias supply (batteries or a-c power supply). A total bias of 120 volts will be required for both c. w. and phone operation; and, if this voltage is delivered by a small line-powered supply, the latter must be exceptionally well filtered, it must have good regulation, and its output resistance must be as low as possible. For

reading grid current, a 0–150 d-c milliammeter is wired in series with the bias supply unit and the positive bias input terminal of the amplifier.

The special, high-reactance r-f chokes, RFC_2 and RFC_3, are connected directly to the tube plates, and their junction connected to the positive high-voltage terminal. A smaller-sized 2½-mh pi-wound r-f choke, RFC_1, is satisfactory for the grid circuit which is series fed.

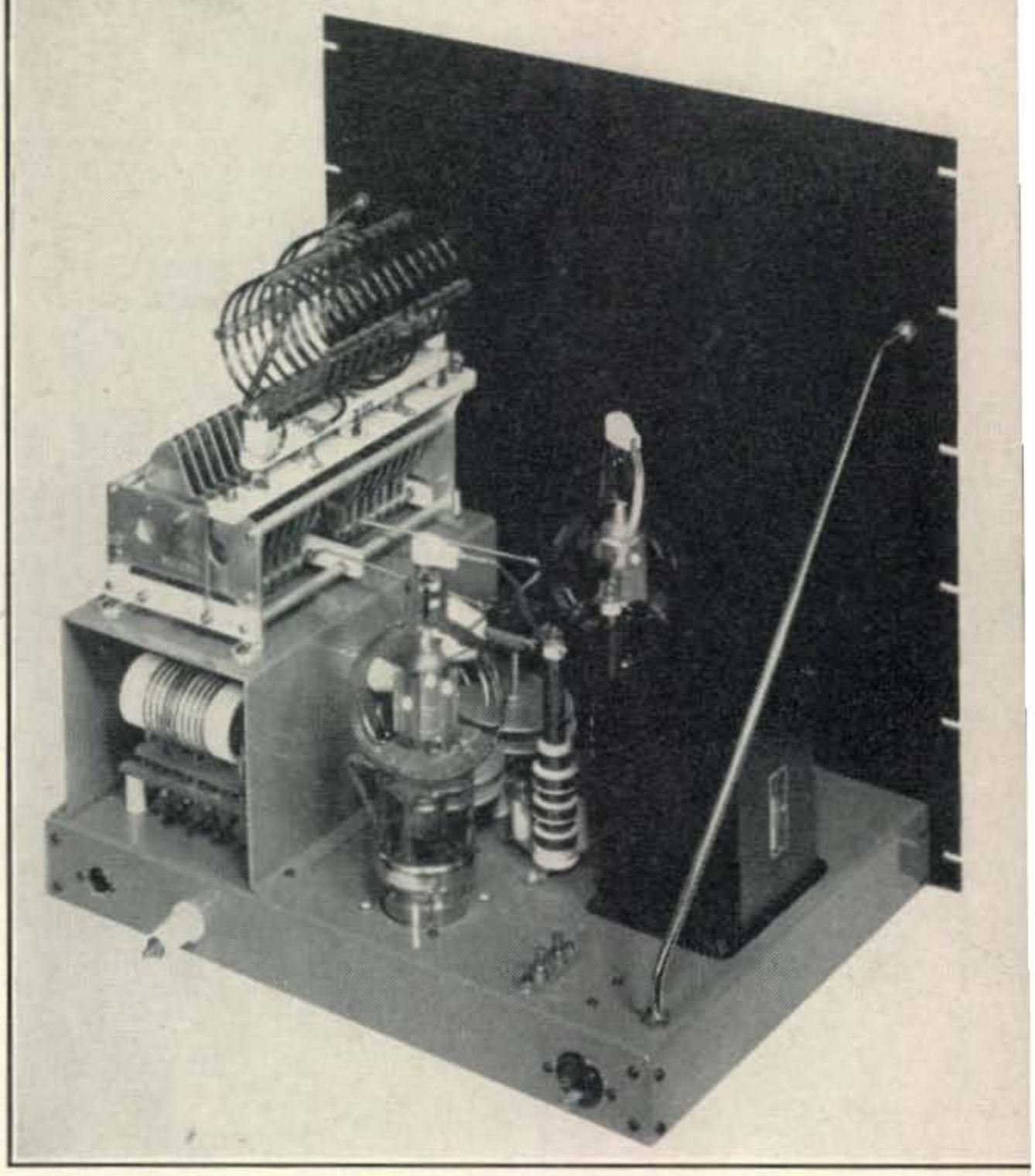
A 0–1 d-c ammeter is connected in series with the high-voltage power supply unit and the negative high-voltage terminal of the amplifier.

Both the grid and plate milliammeters in the author's transmitter were mounted on a separate meter panel, together with similar meters connected in other stages of the transmitter. But the reader may, if he prefers, mount both of these meters directly on the amplifier front panel.

Conventional cross neutralization is employed, neutralizing capacitors C_6 and C_7 each being connected from one end of the plate tank *after the blocking capacitor* (not including it) to the opposite grid. This shunt-fed circuit neutralizes just as easily as the more familiar series-fed arrangement, provided the usual care is taken to prevent interaction between grid and plate coils. Should parasitics crop up, they very likely can be eliminated by means of a simple parasitic choke connected in series with *one* grid lead. Stubborn cases may require use of a choke in each grid, or the use of a manufactured parasitic suppressor.

The circuit arrangement permits the rotors of both grid and plate tuning capacitors to be grounded. This allows these capacitors to be bolted directly to the chassis and the tuning capacitor shafts to be connected directly to the dials without danger of short circuit or shock.

The filament return circuit is conventional: The center tap of the 5-volt winding of the filament transformer is connected to the common chassis-ground point of the amplifier by the shortest route, and the two halves of this winding are bypassed by capacitors C_2 and C_3.



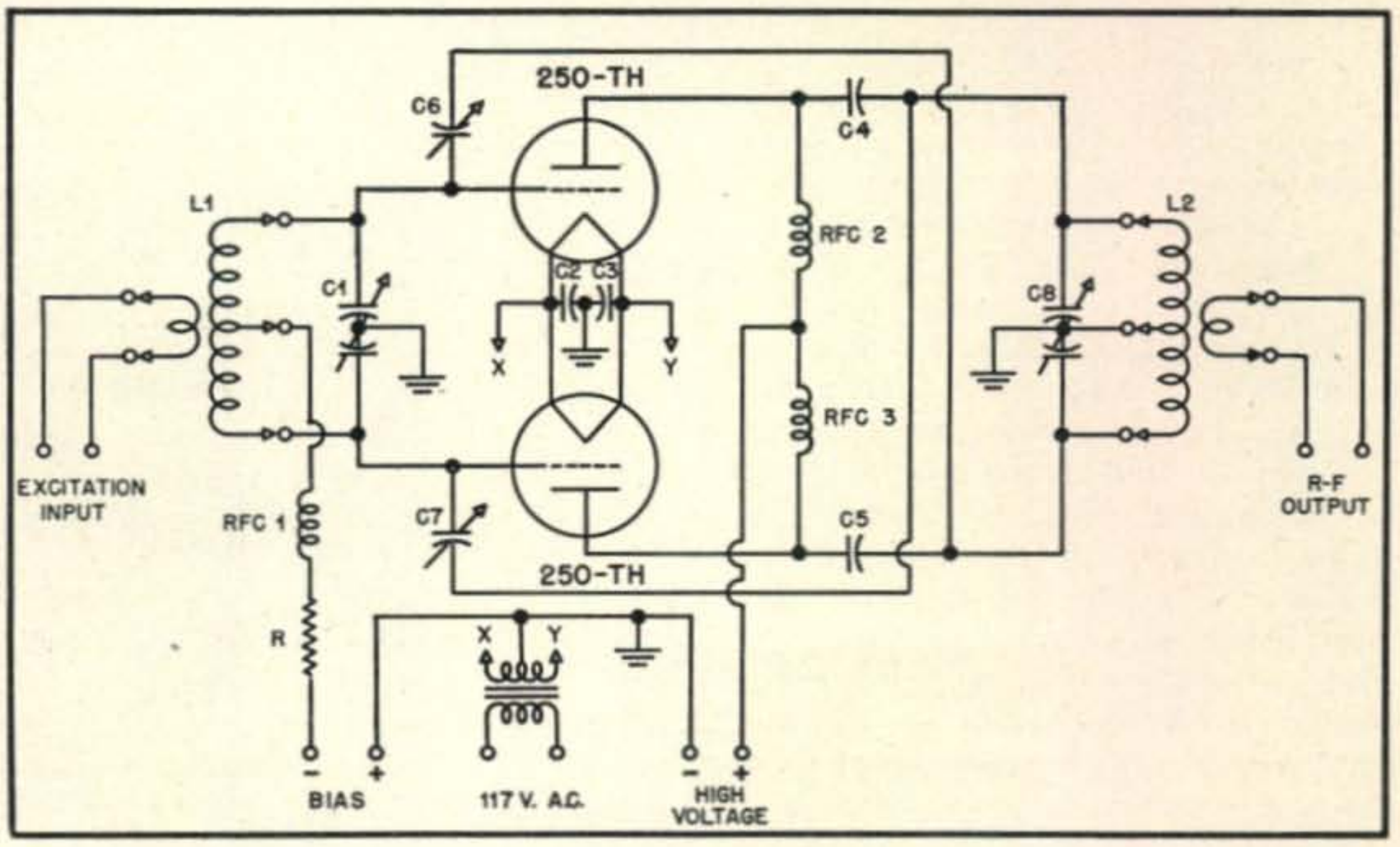
Three-quarter view of the final amplifier clearly shows the type of construction employed in the special r-f chokes designed for application in shunt-fed circuits. Sufficient clearance is provided around the grid coil to permit easy removal. Chassis input connections, left to right, are the bias, high voltage, grid drive, and a.c. for the filament transformer.

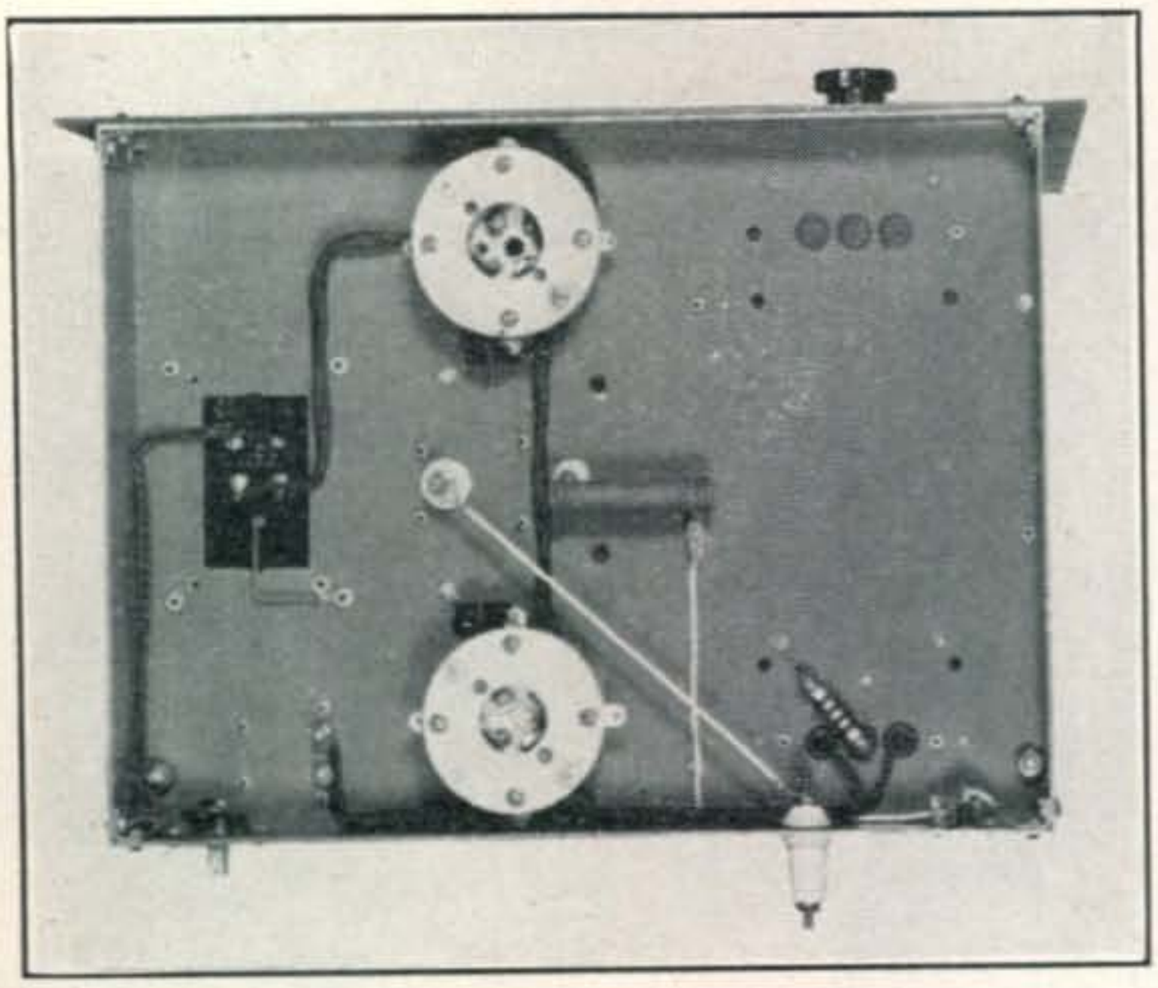
Construction

As may be seen from an inspection of the photographs, the amplifier layout permits easy access to all parts. This is an advantage when making adjustments or for shooting trouble and replacing components.

Fig. 2. Circuit diagram of the complete final amplifier described in the text.

C_1—Dual 100 $\mu\mu$f, variable, 0.077" spacing—(National TMC100D).
C_2, C_3—0.002 μf, 1000 volts, mica.
C_4, C_5—0.001 μf, 5000 volts, mica.
C_6, C_7—N. C. (See Text)
C_8—Dual 100 $\mu\mu$f, variable, 0.171" spacing (National TMA100DA).
L_1—Center-link, c.t.plug-in grid coil.
L_2—Center-link, c. t., kw plug-in plate coil.
R—2000 ohms, 50 watts.
RFC_1—2½ mh, r-f choke.
RFC_2, RFC_3—Special high-reactance r-f choke (National R-175).
T—5 v., 26 amp c. t. (Kenyon T-393).





Bottom view of the final amplifier. The tube sockets are mounted below the chassis to permit direct filament leads and shorter plate leads.

The unit is built on a 17″ x 13″ x 2″ chassis and 19″ x 19¼″ rack panel. The chassis is bolted to the panel by means of several 10–32 machine screws, and two heavy chrome-plated brass "brace rods" serve the dual purpose of panel-chassis brackets and as lifting handles.

The filament transformer is mounted on the chassis as close as possible to the tube sockets. This permits short leads for the high filament current. The primary winding of the transformer is connected to a through-chassis male power receptacle mounted on the rear lip of the chassis.

Grid and Plate Shielding

The grid coil and tuning capacitor are mounted under the steel box-bracket which supports the plate tuning capacitor and coil. This arrangement provides adequate shielding of the input from the output circuit; and, at the same time, makes possible the close placement of grid and plate tuning dials on the front panel. The position of grid and plate tanks keeps short the leads between these circuits and the two tubes.

The jack bar for the plate tank coil is mounted on the frame of the plate tuning capacitor with 1-inch wide brackets made from 0.050″-thick aluminum.

The positive high-voltage lead is brought through the top of the chassis by means of a ceramic feed-through terminal mounted between the two plate r-f chokes. It is important that the holes for the feed-through insulators are cleaned of all burr from drilling. The positive high-voltage input terminal is the ceramic feed-through terminal seen at left rear of the chassis in *Fig. 1*. The negative high-voltage power lead is connected directly to the chassis.

The tube sockets are mounted below the chassis, with 1-inch long supporting studs. This method of suspension keeps the filament terminals and most of the tube bases below chassis, while also lowering the tubes for shorter leads from their plate caps to the plate r-f chokes.

The plate blocking capacitors, C_4 and C_5, are mounted directly on the tops of the plate r-f chokes, RFC_2 and RFC_3. This is accomplished simply by soldering the capacitor lugs directly to the top lugs of the chokes.

The neutralizing capacitors are homemade, their aluminum discs being 2¾ inches in diameter and 1/8-inch thick, drilled and countersunk at their centers for 8–32 flat-head screws. Construction of these neutralizing capacitors may be seen in the photos.

All connections to the plate tuning capacitor and neutralizing capacitors are made with No. 10 solid wire. R-F excitation is delivered to the amplifier through link coupling by way of the two polystyrene-mounted binding posts near the right rear end of the chassis. Other builders may prefer a coaxial chassis connector for this input.

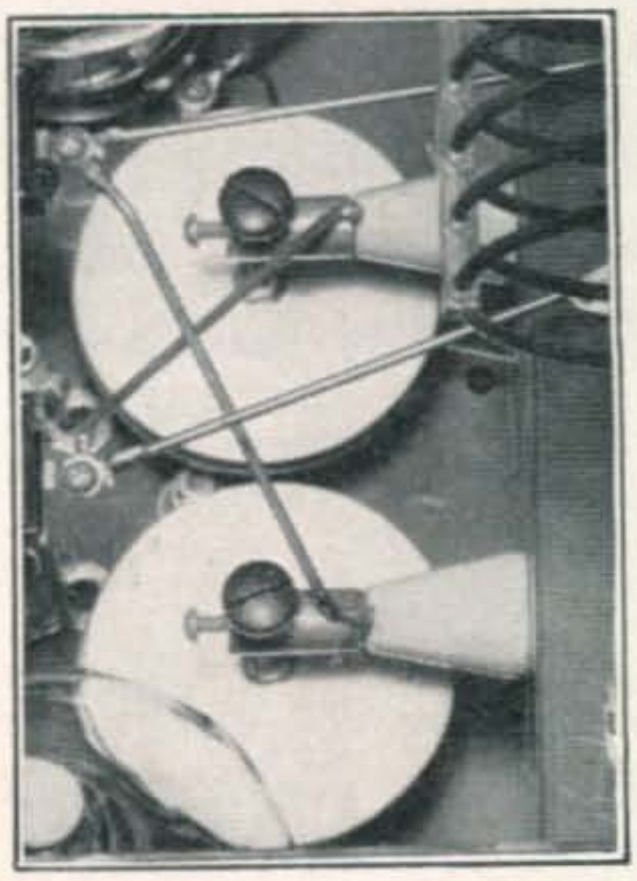
The bias voltage is applied to the 2-terminal receptacle on the left of the ceramic-insulated rear-chassis B+ terminal. Meter leads are passed through grommet-lined chassis holes.

It will be observed from the photographs that fixed link coupling coils are employed in both grid and plate circuits. This has proved no drawback, since our antenna coupler, to which the final amplifier output is link coupled, has a swinging link for varying the output coupling. And our exciter has an output control for varying the final amplifier excitation. Commercially available coils with swinging links may be substituted with no change in circuit constants.

Operating Conditions

Plate voltage for both c. w. and phone may be 2000 volts. Bias voltage for both services at this voltage must be -120 volts. With the amplifier loaded up to 500-ma plate current, a full kilowatt input will be obtained. For recommended operation, 200 grid mils should be developed when the grid tank is tuned to resonance. This will require an exciter-driver output of 75 to 100 watts, with 125 to 150 watts very desirable on 10 meters.

It is recommended that tuning-up and neutralization be carried out at reduced plate voltage. Resonant plate current dip, with antenna and antenna coupler disconnected from the amplifier output, will be approximately 75 ma at 2000 plate volts.



◆

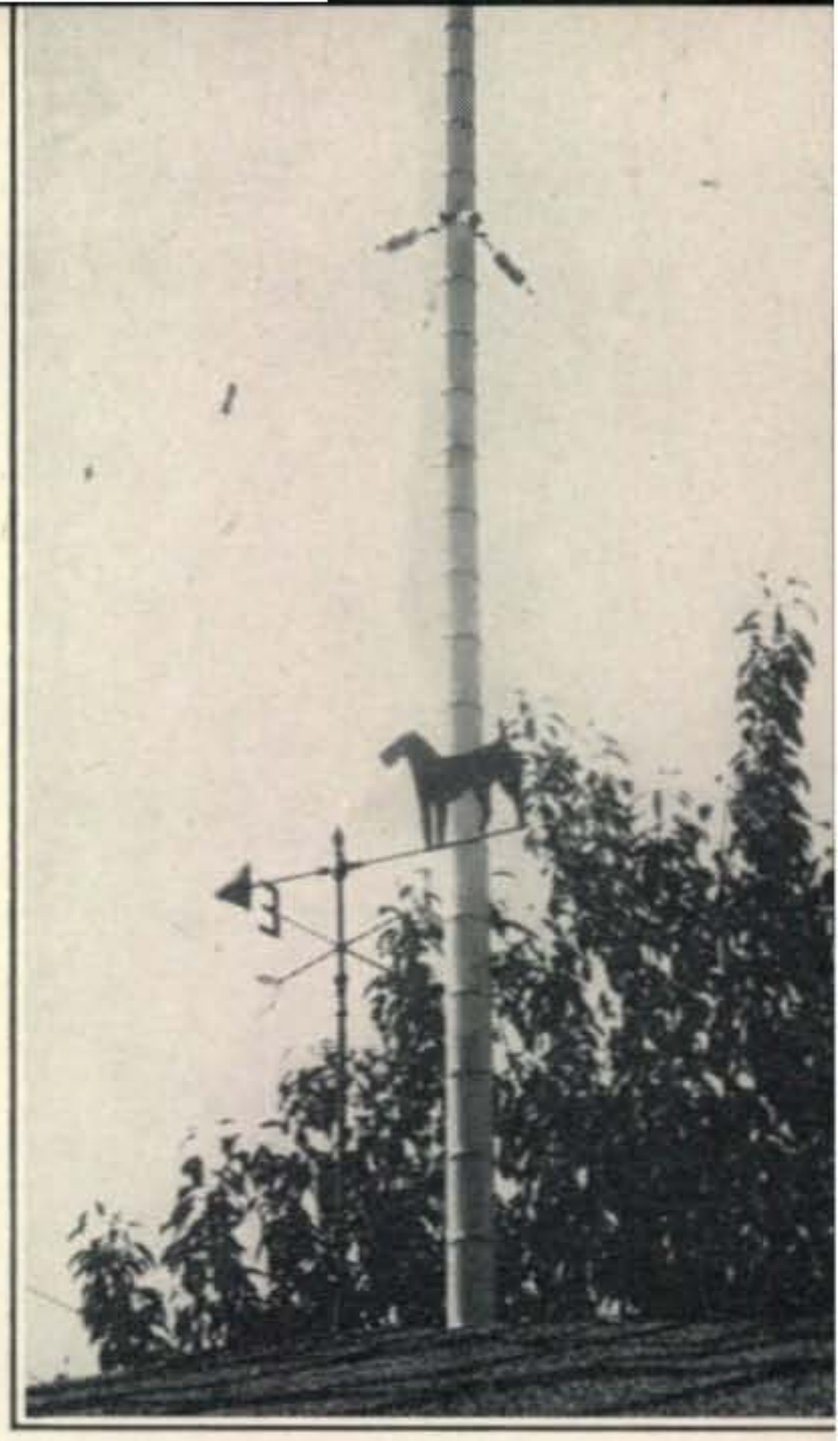
Details of the homemade neutralizing capacitors. The plate blocking capacitors fasten directly to the top of the plate r-f chokes.

◆

The Beer Can Vertical

CLIFFORD PATERNO, W2PPT*

Discarded tin cans can be easily assembled into an inexpensive, sturdy and effective vertical antenna.



The handsome beer can vertical belies its humble origin.

IN A DAY OF EVER rising costs when you can get something for nothing it's time to look twice. The beer can vertical is not an original idea, but it is certainly one that deserves greater popularity. If you have a taste for beer go out and buy two and a half cases . . . if not, put out a call on 14 mc and call for volunteers—you won't have any trouble getting them.

The beer can vertical is mounted on the family garage about fifteen feet from the ground. The base can is secured to a porcelin stand-off insulator, the type used to hold neon tubing. We ran across some on the surplus market for about fifteen cents, although to this day nobody has been able to explain what part they played in the war. At any rate standard insulators may be used and they are available in many different sizes and shapes to fit most installations. The insulator itself is bolted to a heavy metal base, in our case this was an old speaker frame. The speaker frame was then fastened to the garage roof with lag bolts.

It is desirable to open both ends of the beer cans even though this entails considerably more work (the second end shouldn't be opened until the contents have been used). If only one end is open there is a tendency for moisture to form from condensation.

Constructional Details

The first step is to nail down two pieces of furring strips about four or five feet long on your bench. They should be spaced just far enough apart so that the cans do not touch the bench and lay evenly in a row. Do not run the seams of the cans in a straight line as this will cause the completed mast to bow badly. Alternate the seams, that is, one up and one down. Soldering should be accomplished with a 300-watt or larger iron, a blow torch, or an iron which can be heated on an external fire. The best solder to use is half and half bar solder or acid core. Results with either of the two mentioned solders were superior to rosin core solder, which isn't adaptable to soldering on tin plate.

When all the cans are lined up tack about four of them at a time together, soldering them at the top and bottom. The initial joint will hold them firm so you can rotate them and solder all the way around. If you have someone to assist and hold up one end as you solder, about fifteen foot lengths are practical. The top can should have a rain shield soldered to it, which can be nothing more than a round disc of copper slightly larger than the diameter of the can. The bottom can should have a similar plate soldered to it and made out of 1/16 or 1/8" thick copper or brass plate.

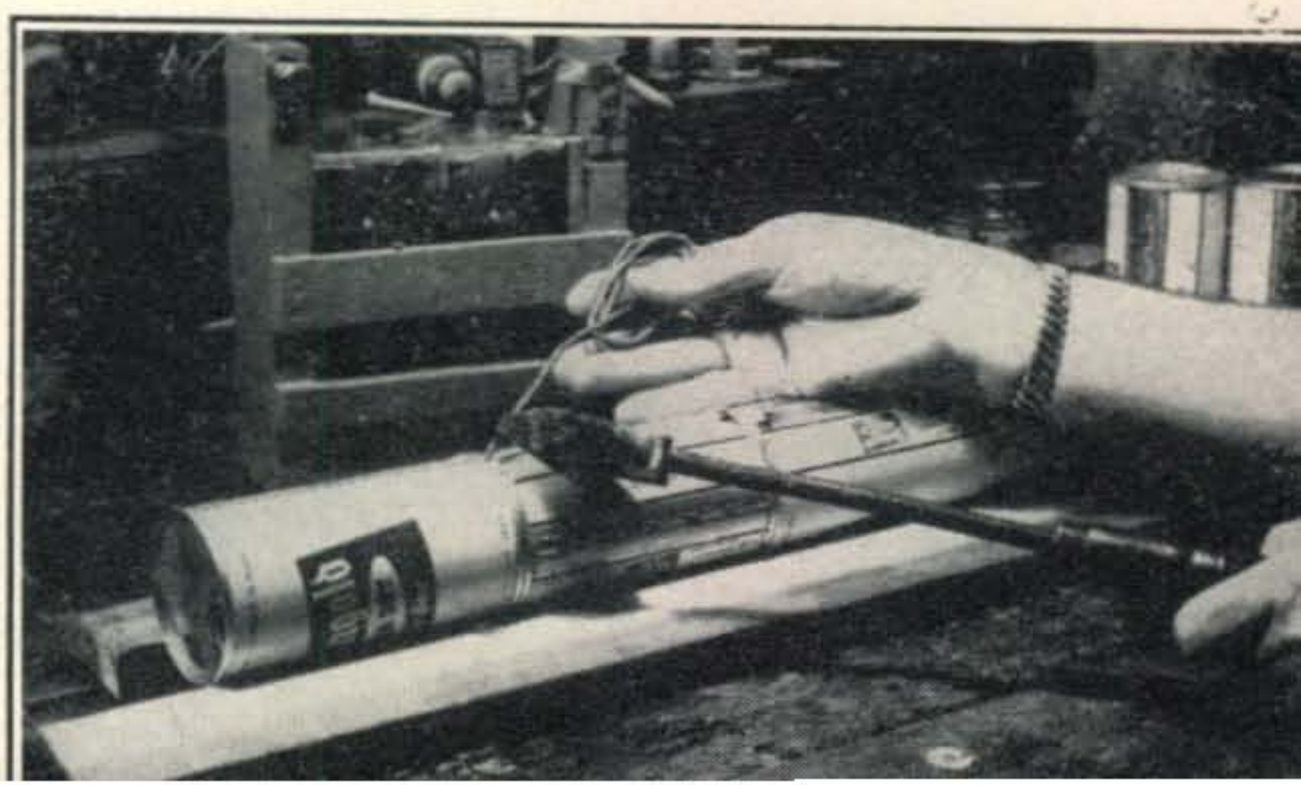
When the soldering is completed moisten a rag with gasoline and wipe all joints clean of acid before painting. The vertical was sprayed with two coats of Duco red-oxide normally used as an undercoat for automobile work. The final paint consisted of two coats of white automobile Duco. Most automobile supply stores carry this or similar paint.

The guy wires are fastened to the beer cans with ¼" copper bands 1/16" thick that are pinched in four places and drilled to take No. 14 galvanized wire. The guy wires are put through the holes and twisted to hold the pinch in shape. Then just above the joint the bands are secured with a nut and bolt. The guy wires are broken up every six feet with starin insulators.

Feeding the Vertical

After trying numerous feed systems we found the most satisfactory to be a 500-ohm line consisting of No. 18 wire spaced 2 inches into a quarter-wave matching stub. The stub consists of No. 12 wire spaced 4 inches. The feeder is slid up and down the stub until the point of optimum loading is obtained. Running 40 watts input excellent reports have been received throughout the U.S. and from numerous DX stations.

Furring strips are nailed to the bench top to hold the cans in position for soldering.



*104-44 108th St., Ozone Park 16, L. I., N. Y.

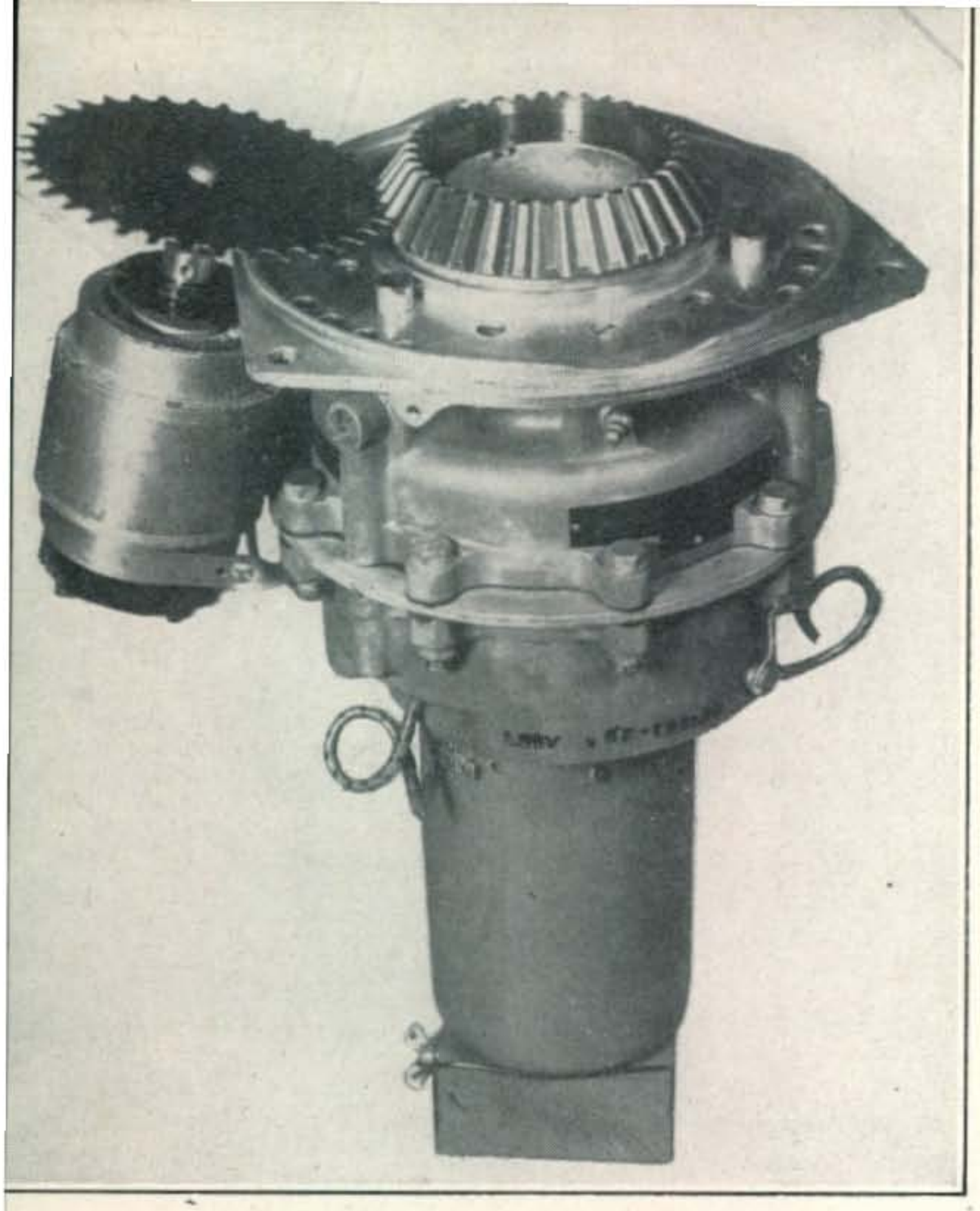


Fig. 1. The B-29 prop pitch-changing motor and the direction indicator Selsyn. The method of coupling through the home-made gear is described in the text.

◆ ◆ ◆

GEORGE M. BROWN, W2CVV*

◆ ◆ ◆

Direction Indicator

For the Prop Pitch-Change Mechanism

THE GENERAL AVAILABILITY of aircraft propeller pitch-changing mechanisms and Selsyn motors in the surplus market has made the acquisition of precision equipment for rotating directive antennas and for indicating their orientation at a remote point, a relatively inexpensive process.

Unfortunately, a certain amount of difficulty has sometimes been encountered in designing and constructing suitable mechanisms for coupling these rotators to the antennas and to the Selsyn generators. Experience with a number of installations involving the smaller of the two rotators which are available, i.e., the one with the straight bevel gear as shown in *Fig. 1*, has permitted the writer to evolve a system which has worked out well in practice and which does not involve difficult machining operations or welding. A somewhat similar approach could probably be equally well applied to the larger rotator having the spiral bevel gear, although suitable changes in detail would be required.

Coupling the Indicator Selsyn

As may be seen in *Fig. 1* a Selsyn is geared directly to the output bevel gear of the rotator. This supersedes a number of more or less unsatisfactory previous attempts involving pulleys, springs and dial cords, with their inherent difficulties of stretching, tangling, creeping, jumping and breaking.

The method of constructing the gear for the Selsyn is shown in *Fig. 2*. A circular thin sheet of dural 5 3/8 inches in diameter is cut out and then a 5-inch circle is scribed. The 5-inch circle is then marked in 36 equally spaced units, corresponding to an angular separation of 10° apiece. These are then drilled out with a 9/32 inch twist drill and finished off in an approximation of 36 gear teeth by means of tin snips and a file.

The gear is then mounted on the Selsyn shaft by means of a short extension to clear the rotator mounting flange and the whole unit is then clamped to the side of the rotator as shown in *Fig. 1*. While this system does not provide a gear drive suitable for coupling appreciable amounts of power, it is adequate for the purpose of direction indication. It also permits constant 360° rotation of the beam.

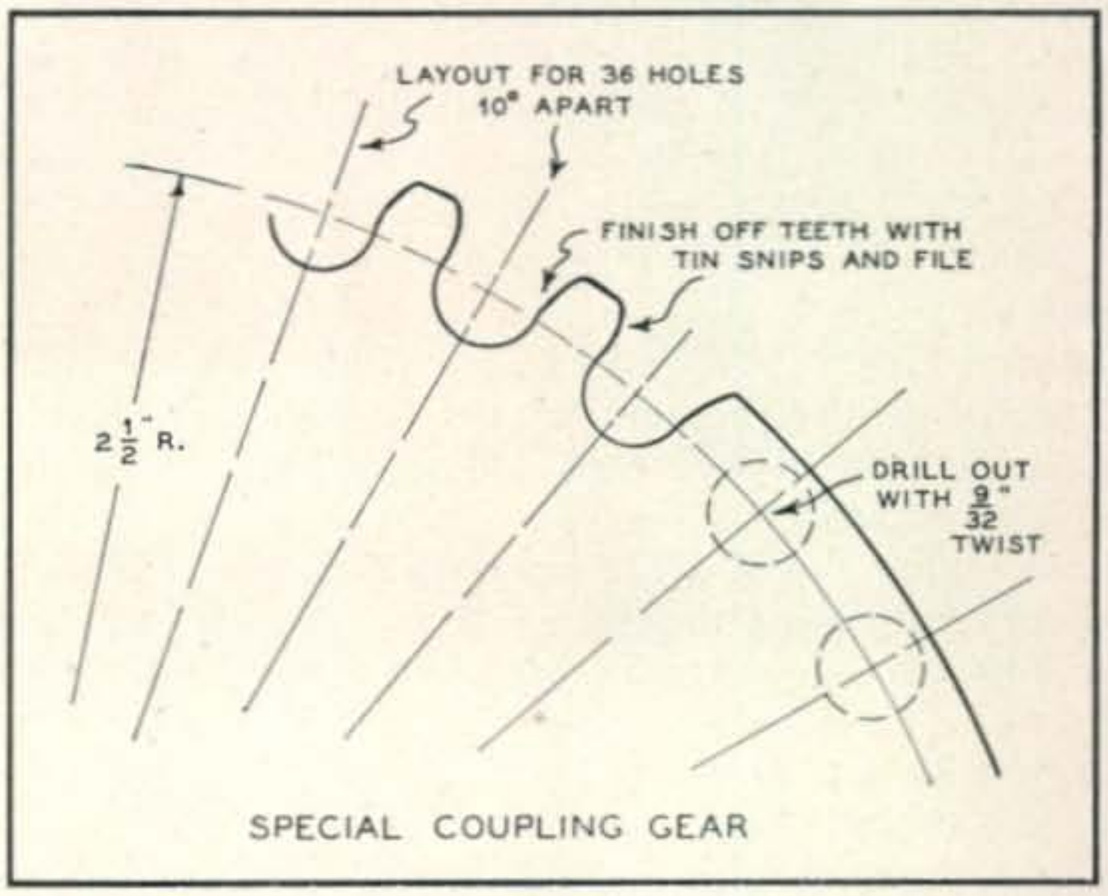


Fig. 2. Method of cutting out the Selsyn generator gear. A dural circular plate is used.

*14 Kingsland, N. Tarrytown, N. Y.

The Antenna Drive Mechanism

The dimensions of the output shaft of the rotator are shown in part 1 of *Fig. 3*. A specially made driving pin is shown in part 2 of the same figure. This pin is machined from a standard 3/8" machine bolt and nut by turning the bolt-head and the nut down to a diameter of ½" approximately 1/8" deep. This then permits either the bolt head or the nut to be inserted into one of the eight holes in the sides of output shaft. Run the nut on the bolt far enough to permit it to be inserted into two of the holes. Back the nut until it wedges the bolt securely into place. The bolt then forms the rest for a length of 1¼ or 1½ inch pipe. This pipe may either be the antenna drive shaft or the antenna mast itself. Notch the pipe at the bottom to fit securely around the driving pin. Be careful that the notches are accurately fitted and have straight sides to avoid backlash.

It is best to avoid applying thrust to either this driving pin or to the bottom of the output shaft in which the pipe is inserted. A heavy-duty thrust bearing is provided under the bevel gear capable of handling the full weight of any reasonable antenna, but it does not support the splined drive shaft. The best bet is to provide a collar for the driven pipe or mast so located as to transmit the antenna weight to the top of the bevel gear, supporting the pipe clear of the bottom of the cup and without the driving pin bottoming in the notch. The collar may be made from a pipe flange bored out to clear the pipe and pinned or bolted in place.

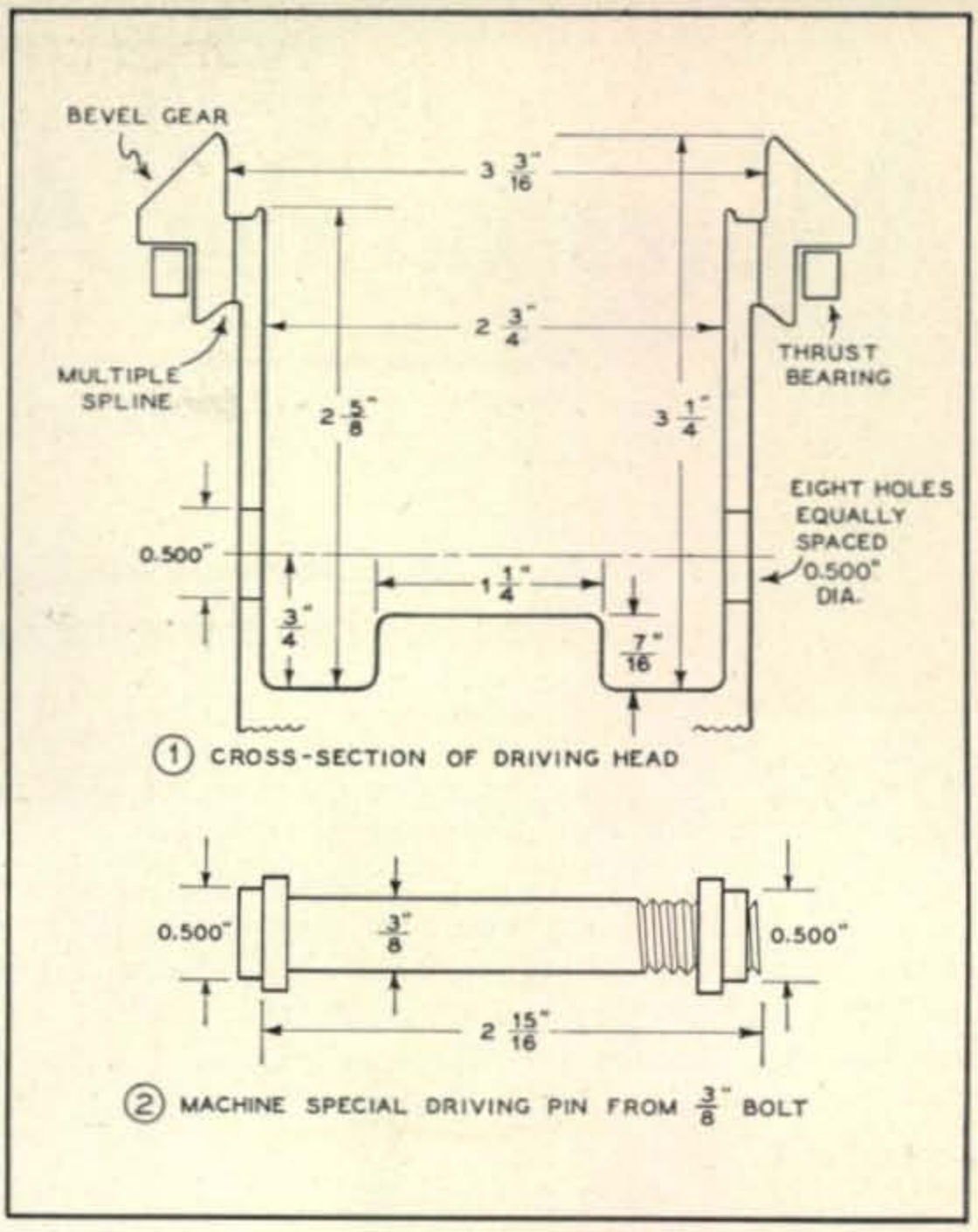


Fig. 3. Cross-section of the output shaft and special driving pin.

Old-Timers Organize

There are radio clubs, wireless clubs and other ham organizations, but it was only recently that the old-timers organized and formed the Quarter Century Wireless Association.

The planning or the "inspiration" for an old-timers organization came about when six old-timers met on a 10-meter round table. A suggestion to get together was made by W2UD and it was quickly seconded by W2DX, and W2FD. The rest of the gang, W2DI, W2EF and W2FX, were also in accord. W2FX, John DiBlasi, was appointed to get the gang together over a dinner table and formulate plans for the organization.

Some days later in New York, thirty-five old-timers met in a downtown restaurant. Each man present has been a ham for over 25 years. After dinner and liquid refreshments the group settled down to business and the Quarter Century Wireless Association was formed. The purpose of the association is purely social, and any ham who has had a license for 25 years, or who had a license 25 years ago and is now back in the game, is eligible. It was decided to hold at least one general meeting per year.

John DiBlasi, W2FX, was elected president; George Droste, W2IN, vice president; Leon Hansen, W2FIT, secretary; and Dave Talley, W2PF, treasurer. The following charter members were present at the get together: W1HRX, W2BW, W2KR, W2AMJ, W2AMB, W2EF, W2RB, W2EA, W2CO, W2LFR, W2CVF, W2FD, W2BJ, W2GX, W2DX, W2UD, W2FO, W2EC, W2II, W2FZ, W2YW, W2PL, W3LXP, W2MM, W2BT, W2KW, W2OG, W2BR, W2WZ, W2AFB, and W2GG. The Quarter Century old-timers are interested in hearing from other old-timers.

Old-timers at their first get-together meeting. Left to right: W2GX, W2YW, W2CO, W2AFB, W2MM, W2AMJ. W2FIT, W2BT, W2BR, W2FO, W2EF, W2PL, W3LXP, W2RB, W2GG, W2EA, W2KW, W2WZ, W2II, W2FZ,

Notes on the Angle of Radiation

OLIVER P. FERRELL*

The performance of any antenna is closely related to the angle of radiation. How to determine and obtain the optimum angle is discussed in this article.

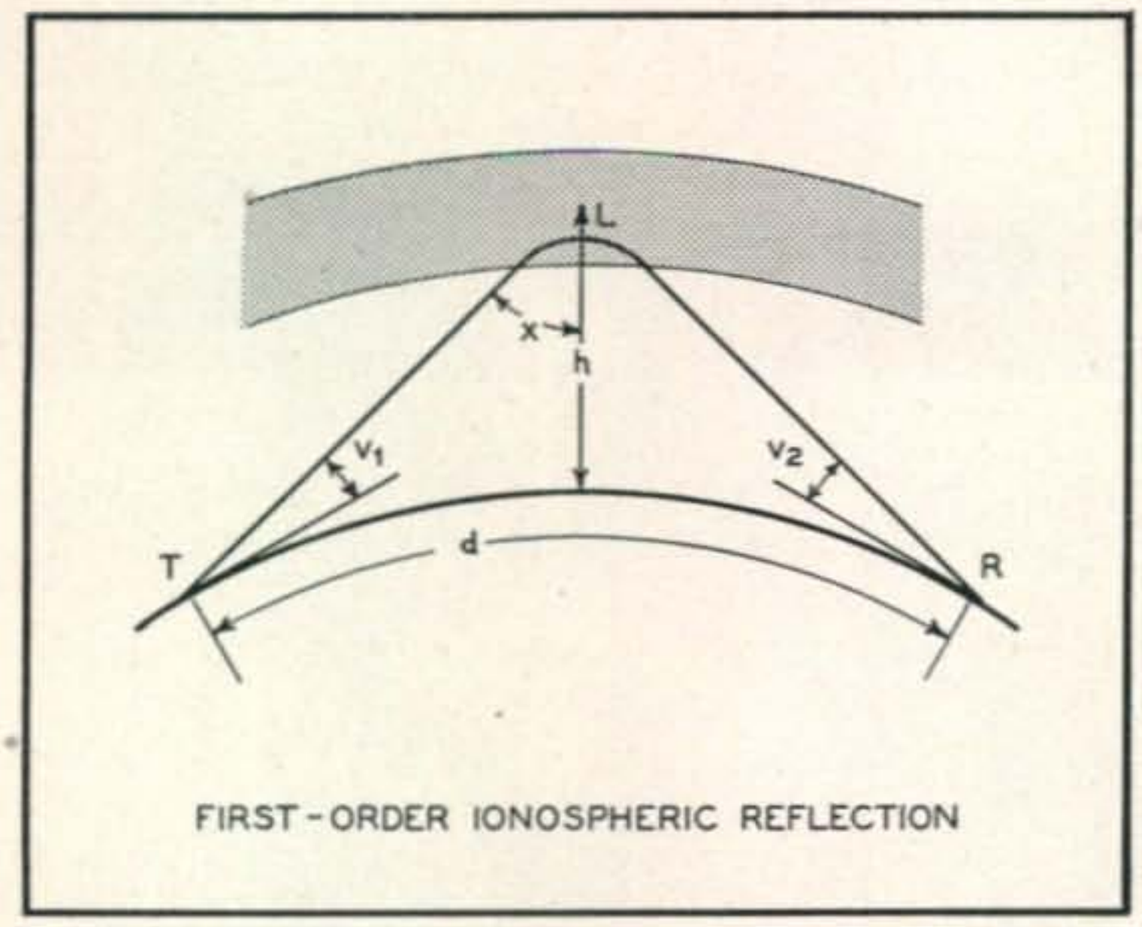
ANTENNAS AND THE ANGLE OF RADIATION always make good amateur topics. However, there appear to be as many divergent opinions as there are participants in any one discussion. Each viewpoint is based largely upon individual observations and results, but more often as not many underlying contributing factors are completely ignored. These are the factors of what happens to the signal in the ionosphere.

If the ionosphere surrounding this earth were uniform, many of our antenna troubles would disappear. But the ionosphere is not uniform. It varies in density and height from place to place at at any one given instant. These variations themselves depend upon the time of day, magnetic activity, the season of the year, and probably the epoch of the sunspot cycle. Thus, an antenna which performed excellently during the late spring and summer of this year may have a very difficult time catching the DX during the latter part of this coming fall and early winter. Because such things have happened and will happen again this article is written.

Geometry of Ionospheric Transmission

The diagram *Fig. 1* illustrates the geometry of a first-order ionosphere reflection. The virtual height (h) of the reflecting layer is greatly exaggerated to show the origin of the vertical angles of signal arrival (V_2) and transmission (V_1). The great circle range is represented by distance (d), while x is the angle of incidence at the ionosphere layer. As the earth is practically spherical the angles V_1 and V_2 are equal. Layer height (h) is variable and is the controlling factor in determining the size of the triangle TLR and hence angles V_1 and V_2, the vertical angles become larger as the layer height is increased. If we temporarily fix the layer height and increase the separation d the vertical angles will then decrease to 0, beyond which point single-hop or first-order transmission would be impossible. Actually, in practice these angles never become quite this small since ground absorption greatly attenuates all energy radiated below 2½°. At large values of d there will be multiple hops between T and R, the angles V_1 and V_2 becoming greater for two hops than for one hop; or greater for three hops than for two.

*Assistant Editor, CQ.



FIRST-ORDER IONOSPHERIC REFLECTION

Fig. 1. Geometry of a first-order ionospheric reflection.

The E-Region

The particular ionospheric heights affecting amateur transmission are divided into the E and F-regions. The E-region consists of a single low-density layer which is generally found during the daytime at a height of from about 110 to 120 km (68.4 to 74.5 miles). During the month of April, 1948, the maximum usable frequency propagated over a path of 1200 miles via the E-layer will be 19 mc in the continental United States. The MUF (or in a manner of speaking the density) varies directly with the hour angle of the sun and drops to a very low value during the night—exhibiting little or no effect upon the 80-meter band. During the summer and spring months an intense sporadic-E ionization may be observed for short periods. This ionization, although sometimes capable of reflecting 60-mc signals, appears to be immersed within the normal E-layer and the heights of the two conditions are about equal.

Fig. 2 shows the angle of signal arrival and the angle of incidence at the E-layer for a height of 110 km. Sporadic-E 6-meter amateur reports substantiate the previously mentioned 2½° lower limit in the angle of radiation for a single hop. Very few of the 6-meter DX transmissions cannot be definitely traced to second-order or double-hop propagation. It will be noted that with the exception of 80 meters almost all of the 40 and 20-meter communications via the E-layer take place beyond 300 miles. The line in the graph indicates that this requires an angle of radiation of less than 24°. The majority of E-layer and sporadic-E contacts are made between 500 and 900 miles, or at angles between 14° and 6°.

The F-Region

The F-region of the ionosphere must be subdivided into the high-density daytime F2-layer and the

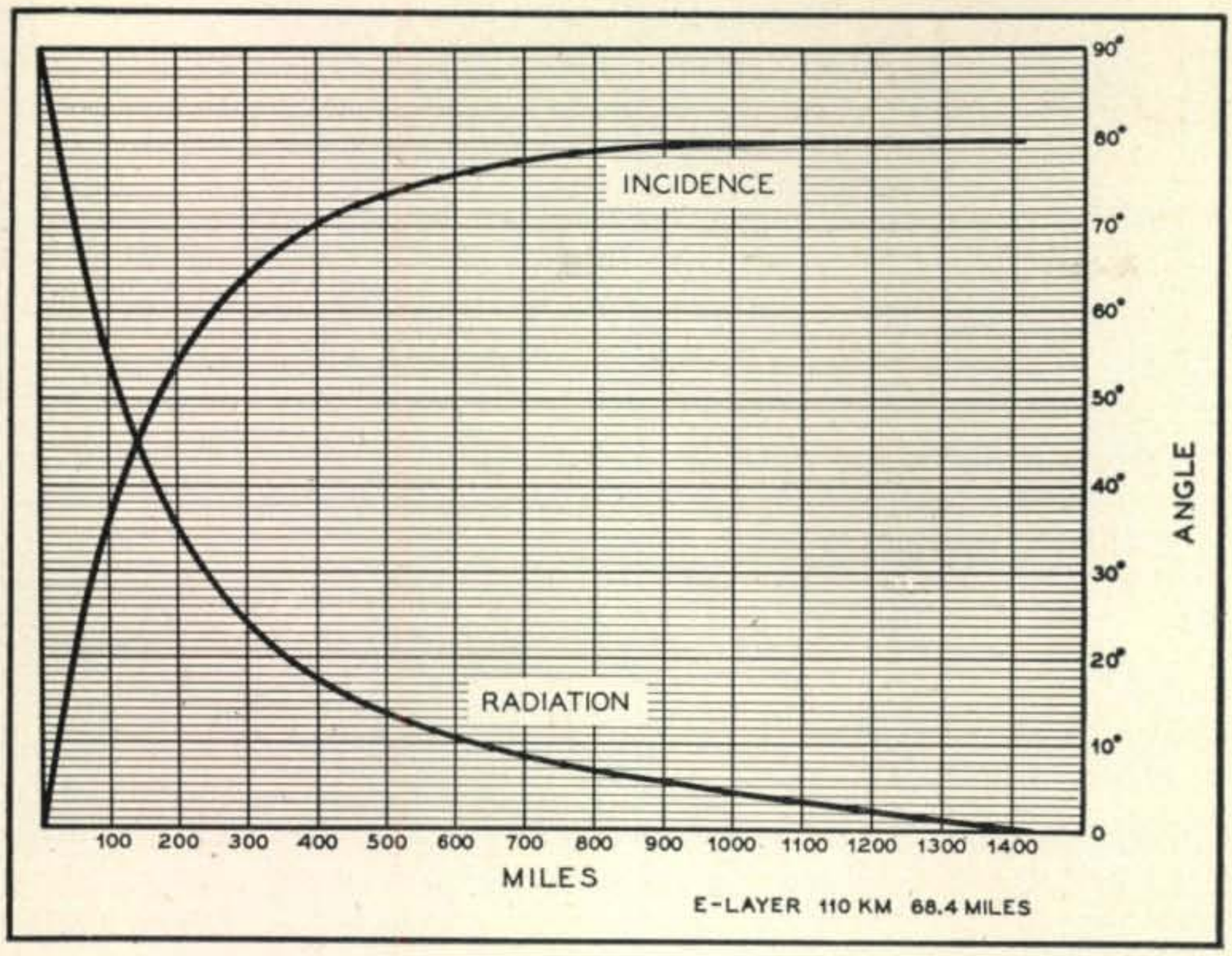


Fig. 2. Variation in the angle of incidence and angle of signal arrival for a normal E-layer reflection.

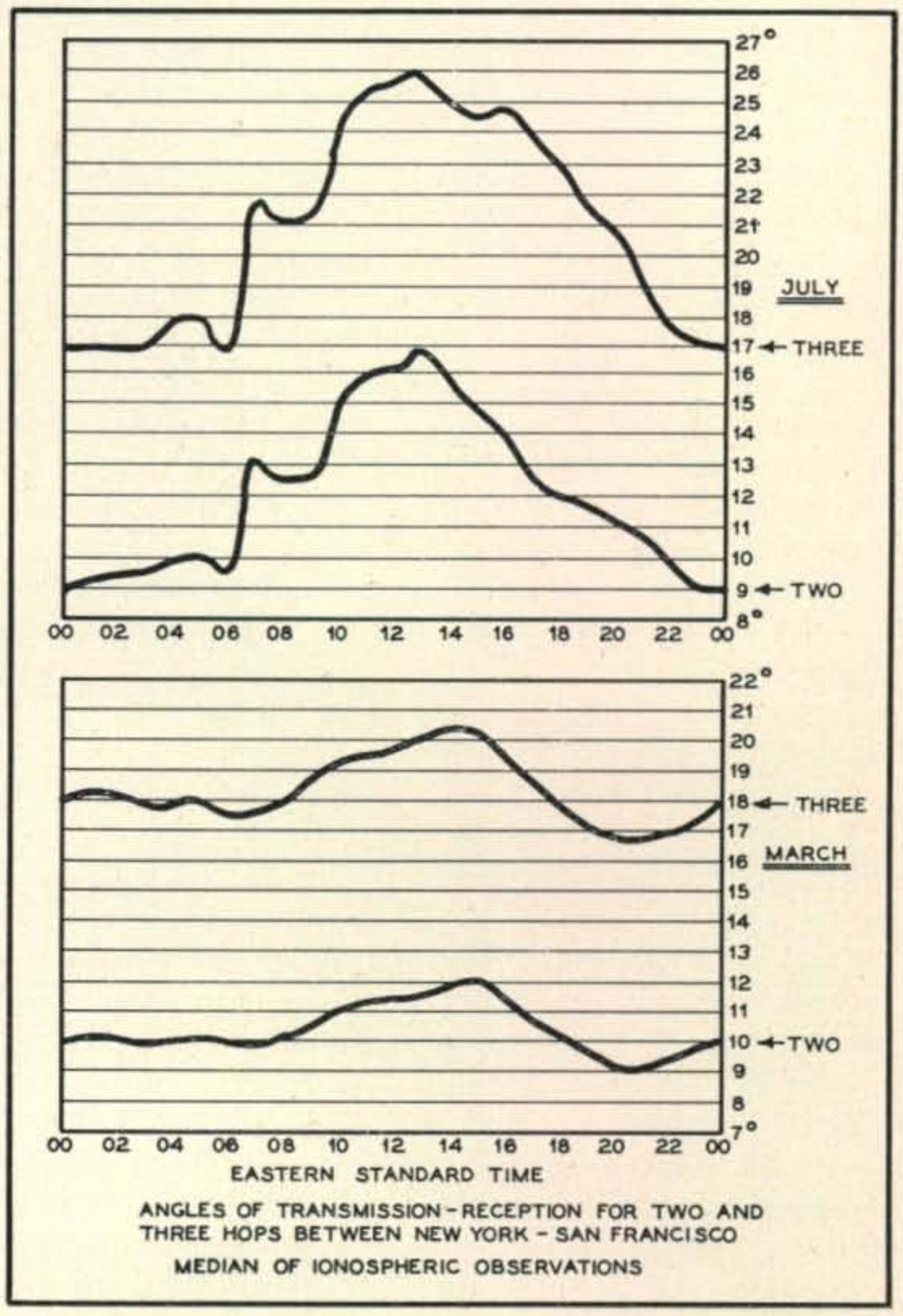


Fig. 3. Seasonal variation in the angle of signal arrival.

weaker F-layer during the night. This change in nomenclature is necessary because of the great diurnal changes in the virtual heights of the F, F2-layers. During the summer day the height of the F2-layer is much greater than during the winter day, although the year around night time height of the F-layer is fairly constant (about 300 km, 186 miles). Just before winter sunrise at the height of the F-layer there is a sharp decrease dropping the layer 50 to 70 km; this is followed by a rise in height as the F2-layer is formed bringing it up to the 280–300 km level. Immediately after summer sunrise there is a pronounced increase in the F2-layer height—to about 400 km—which is maintained throughout the day and part of the evening. The effect of these wholesale seasonal height variations may not be obvious, so to illustrate this point we have selected a fixed path and utilized ionospheric measurements of the virtual height to ascertain the effects upon the angle of radiation.

Seasonal Angle Variations

Figure 3 shows the calculated angles of signal arrival necessary for double and triple-hop transmission between New York and San Francisco. In the bottom graph the medians are drawn for the month of March and in the upper graph they are drawn for July. During the equinox the double-hop angle is relatively steady throughout the day, although slowly varying between 12° and 9°. The triple-hop angle in the same period varies from about 17° to a little over 20°.

In mid-summer there is considerably more variation in the necessary angle. The double hop during the night remains about 9° which is consistent with the aforementioned statements regarding summer and winter night time heights. Shortly after sunrise there is a sharp 4° increase in the angle of signal arrival; this is followed by a slight dip and then a steady rise until a peak angle of 17° is reached at 1300 hours EST. A similar effect would be observed on the triple-hop angles from the night minimum of 17° to a daytime peak of 26°. This shows that it would be entirely possible to construct an antenna during the summer which will work excellently over this path, if for example, it had its main lobe at 23° and depended upon triple-hop propagation. As the equinox is approached the F2-layer height drops steadily until the optimum triple-hop angle lies well below 23°. The result would be fewer contacts and/or considerably weaker reports.

The question immediately arises as to the hour-to-hour stability of these vertical angles. Fortu-

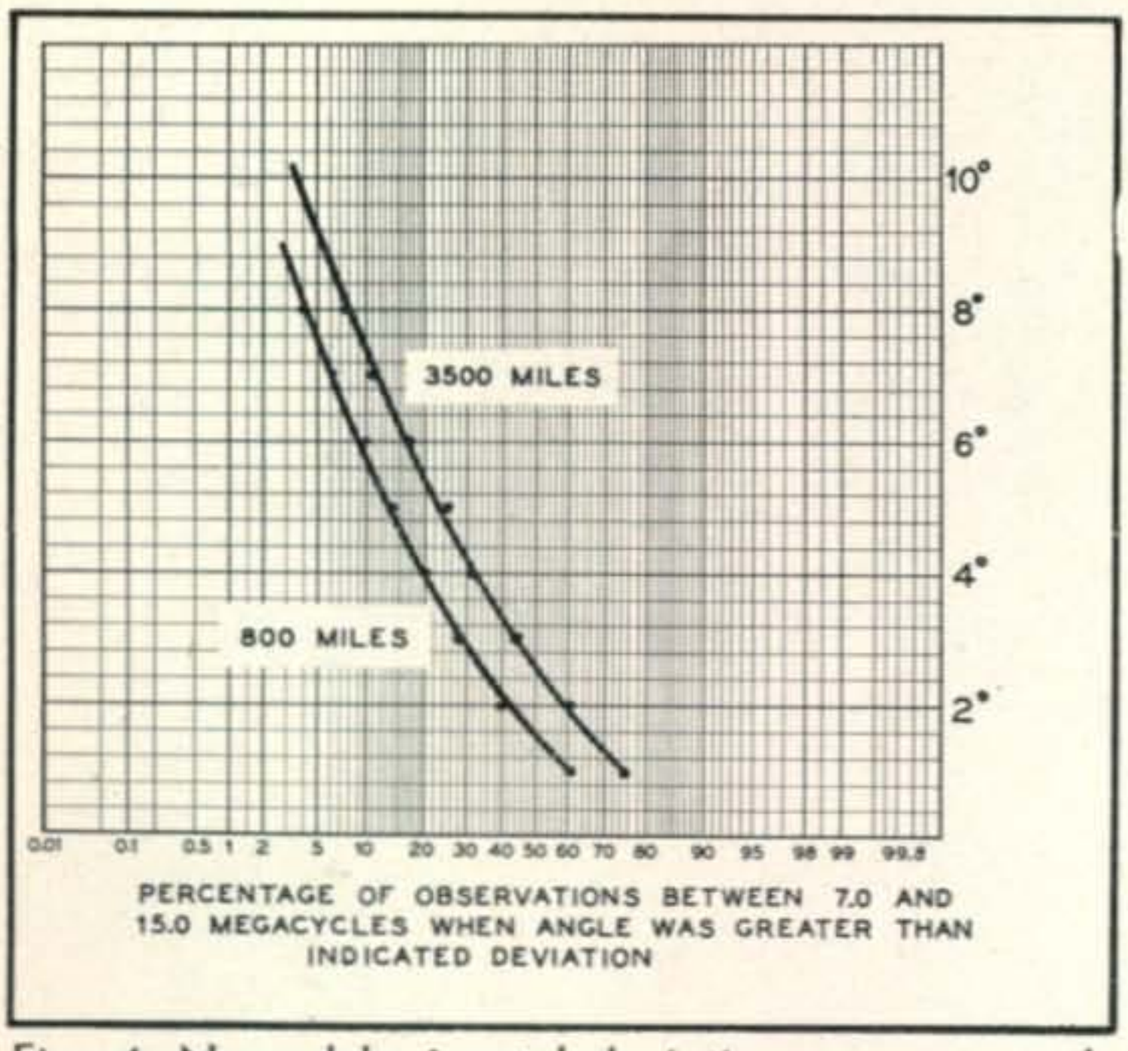


Fig. 4. Normal horizontal deviation over two paths from the great circle route.

nately, a very large number of accurate measurements of the vertical angle of signal arrival have been made. Recently, angular reciprocity in long distance transmission was established through tests between the G.P.O. in England and the American Telephone and Telegraph Company in the United States. These tests showed that during ionospherically quiet conditions either the double or the triple-hop angles were stable and nearly equal at both ends of the path to within ± 1°. Some hour-to-hour variation was observed, but generally this amounted to less than 3° or 4°. During ionosphere storms the vertical angles were considerably higher and the deviation within relatively short periods of time was often as high as 8° or 9°.

Another short period variation will be noted when the 10-meter band is just opening or closing. This is due to the changes in the required angle caused by the proximity of the operating frequency to the maximum usable frequency. The effect is for the reflection to take place at a very high level in the F2-layer necessitating the use of the higher angles of radiation. This is followed by a gradual settling—sometimes within 10 to 20 minutes—to a normal lower angle pattern. The higher angle and greater height reflection does not apply to short-skip transmission on 6 or 10 meters caused by sporadic-E. Layer ionization of the sporadic-E type has a very sharp discontinuity and does not exhibit any appreciable change in height near the critical or the maximum usable frequency. Except for the ionospheric storm effects and the sunrise-sunset height variations the vertical angle of signal arrival for any particular mode of transmission was found to be fairly steady over reasonable periods of time.

Horizontal Deviation

On all except short distances there will be some lateral or horizontal deviation at certain times in high-frequency communication. While there have never been many accurate measurements made above 25 mc, there is, however, reason to believe that the extent of lateral deviation varies inversely with frequency.*

Measurements taken between 6,000 and 20,000 kc show that on paths crossing entirely within daylight areas the normal horizontal deviation should be less than 2°. At night, and particularly when a path is partially in darkness there will be some deviation amounting to usually less than 5°. During ionosphere storms there are rather wide departures from the great circle routes, and lateral deviations of 16° to 18° at 3000 miles are not uncommon. Various amateur and commercial observers have reported exceptional deviations of 60° to 75° during intense ionosphere storms. At certain times it is not too uncommon for an improved signal-to-noise ratio to exist over the deviated route.

The results of a large number of horizontal angle or azimuth determinations are shown in *Fig. 4*. The graph shows the percentage of time when the indicated angles were exceeded over path lengths of 3500 and 800 miles. It is particularly noteworthy that deviation is somewhat more common over the longer route. This is probably due to the influence of scattering sources and the patchy or cloudy structure of the F2-layer. Over the 3500-mile path a deviation of 4° or greater from the great circle route was observed about 32% of the time. Over a shorter 800-mile path the 4° deviation was observed only about 20% of the time. An 8° deviation was noted 8% of the time at 3500 miles, but only 4% of the time at 800 miles.

The Most Useful Angles

A forecast of the most useful angles of radiation can only be made by establishing certain arbitrary factors—most important being the distance range (*d* in *Fig. 1*). Knowing the path length and the frequency in advance it is possible to estimate the most useful angles over an extended period of time. The forecast is made by correlating the distance range with the MUF and layer heights from the sounding of the nearest ionospheric station to the midpoint of the path. For paths less than 3500 km (2175 miles) the resultant analysis would be drawn as shown in *Fig. 5*.

In this probability graph an arbitrary path of 2200 km (about 1365 miles) was chosen. The useful angles of radiation or reception for the 10 and 20-meter bands were calculated. These were determined from the Washington, D. C., F2-layer heights at twelve noon on each consecutive seventh day from November, 1946, to October, 1947. This provides approximately one complete year of sampling. The bottom scale shows the percentage of time when the angle of radiation was below the value given on the ordinate scale.

When the 10-meter band was open over this path a single-hop angle of 10° represents a median value—or the value recorded during 50% of the observations. Therefore, an installation designed especially for this frequency and distance range would find the 10° angle of radiation the most useful throughout the entire year. In amateur work a 10-meter antenna whose lowest lobe was about 14° above the horizon would find communication extremely difficult over this path length. The graph shows that the neces-

* Not included in this category is the *rebound* type scattering described by Heightman in Sept., 1947, *CQ*.

sary angles of radiation were below 14° over 95% of the entire year at this hour. Also, at this distance range even too low an angle would be unwanted as the angles below 8° were only usable less than 20% of the time.

The plot for the most useful angles at 20 meters is divided into two distinct parts as both single and double-hop transmission are possible at this range. For single-hop transmission the 20-meter band is open considerably more than the 10-meter band. This causes a slight shift in the percentage ratio for the most useful angles. In the case of a range of 2200 km, the 20-meter band median angle would be 12°. 95% of the time we should expect the single-hop angle to be less than 18°, while only 20% of the time it is less than 9°. When the MUF is sufficiently high there will be double hop or second-order transmission taking place at somewhat higher angles of radiation—25° representing the calculated median. 97% of the time an angle of less than 30° would be required, although 22° is usable only 9% of the entire year in two-hop work at 2200 km. It is noteworthy here that a 20-meter beam antenna with its principal lobe at 20° would be practically valueless for either single or double-hop transmission.

Naturally, at distances greater than 1365 miles and up to 2400 miles the median angles will be lower. On 20 meters both the single and double-hop angles will be greater at the shorter ranges. The forecast is representative of the conditions that amateurs will encounter if one antenna with a fixed pattern is used to work in or near one specific location.

Calculating the Angle of Radiation

Many amateurs hesitate to use the formulas or graphs that are available to estimate the angle of radiation from their antennas because they involve complicated mathematical formulas, the effects of ground conductivities, the effects of parasitic elements and other variables. There is, however, a simple method for calculating the angle of radiation of any amateur antenna.

It is known that if a horizontal antenna is over one-quarter wavelength above ground the pattern derived for perfectly conducting earth will be very close to the actual pattern of the antenna. The greatest deviation between the two patterns will take place at the higher lobes—particularly, those above 40°—but this holds little consequence for 10, 20 or 40-meter amateur work. The only other assumptions necessary are the attenuation in the bottom part of the lowest lobe and the restriction of radiation to angles above 2½°. Contrary to popular opinion, a stacked array has the tendency to raise the angle of radiation, although it may often work slightly better since more power will be concentrated in the forward direction.

If the antenna is less than two wavelengths long and is not a stacked antenna, a sufficiently accurate formula to find the first and second lobes and the intervening null is as follows:

$$(1).\quad \frac{\lambda}{4\,h} = \theta \text{ lowest possible lobe}$$

$$(2).\quad \frac{\lambda}{1.9\,h} = \theta \text{ null}$$

$$(3).\quad \frac{\lambda}{1.25\,h} = \theta \text{ second highest lobe}$$

where

λ = wavelength in meters

h = height above ground in meters

θ = radians (one equals 57.3°)

Example: An 11-meter band station is using a horizontal half-wave antenna which is 46 feet (14 meters) above ground level. The location is fairly well in the clear and there are no large obstructions near the antenna. The lowest possible lobe at the given height is then equal to

$$\frac{\lambda}{4\,h} = \theta_{\text{lowest}} = \frac{11}{(4)(14)} = 0.19 \text{ radian}$$

$$= (0.19)(57.3) = 10.8°$$

the null angle is then

$$\frac{\lambda}{1.9\,h} = \theta_{\text{null}} = \frac{11}{(1.9)(14)} = 0.41 \text{ radian}$$

$$= (0.41)(57.3) = 23.5°$$

the second highest lobe would be

$$\frac{\lambda}{1.25\,h} = \theta_{\text{second}} = \frac{11}{(1.25)(14)} = 0.63 \text{ radian}$$

$$= (0.63)(57.3) = 36°$$

Conclusions on the Angle of Radiation

It is impossible to over-emphasize that there is no one *best height* for an amateur antenna. The number of variables rule out the likelihood that any antenna will operate proficiently throughout the entire year. For the best results it would be neces-

(*Continued on page 102*)

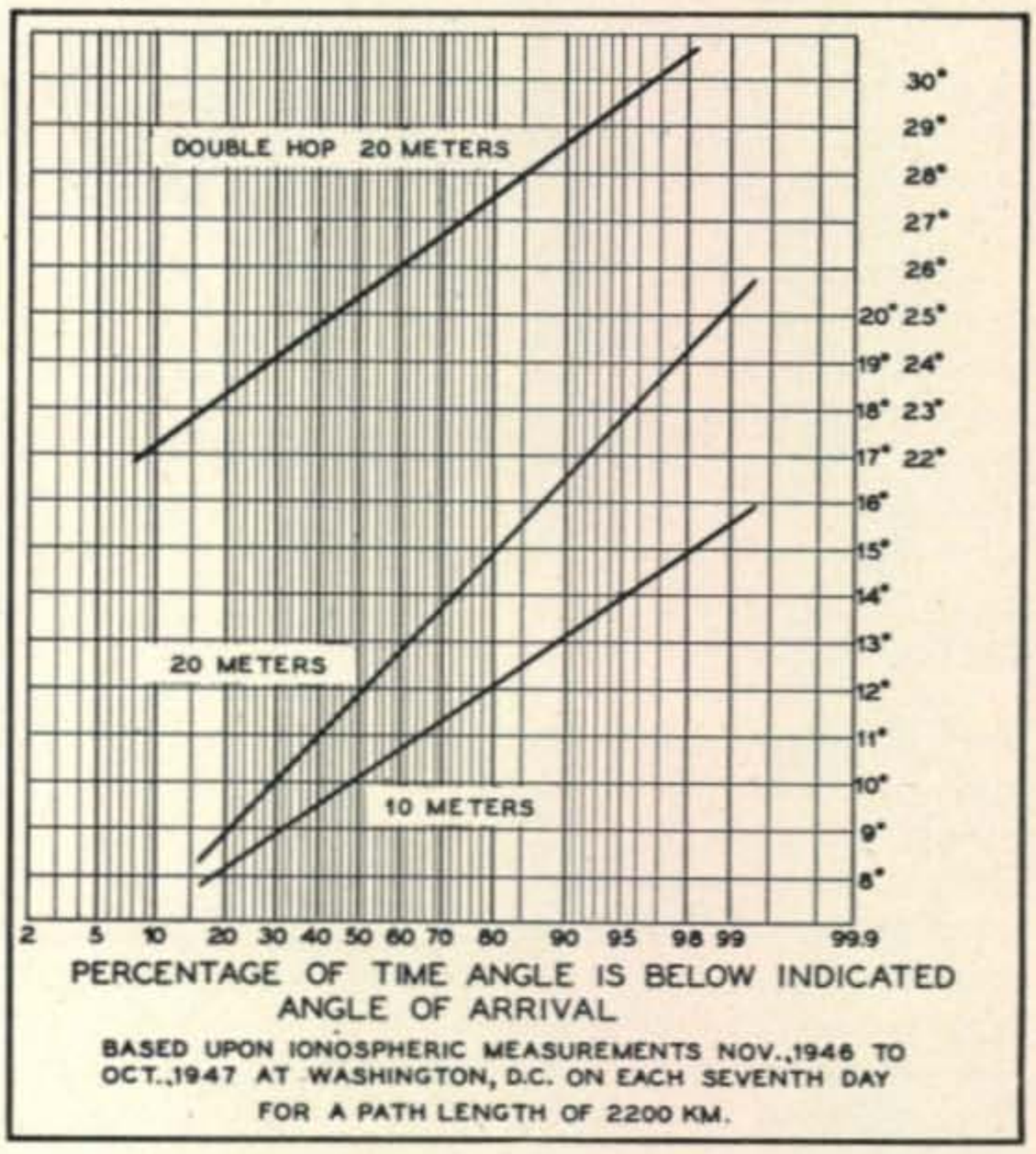
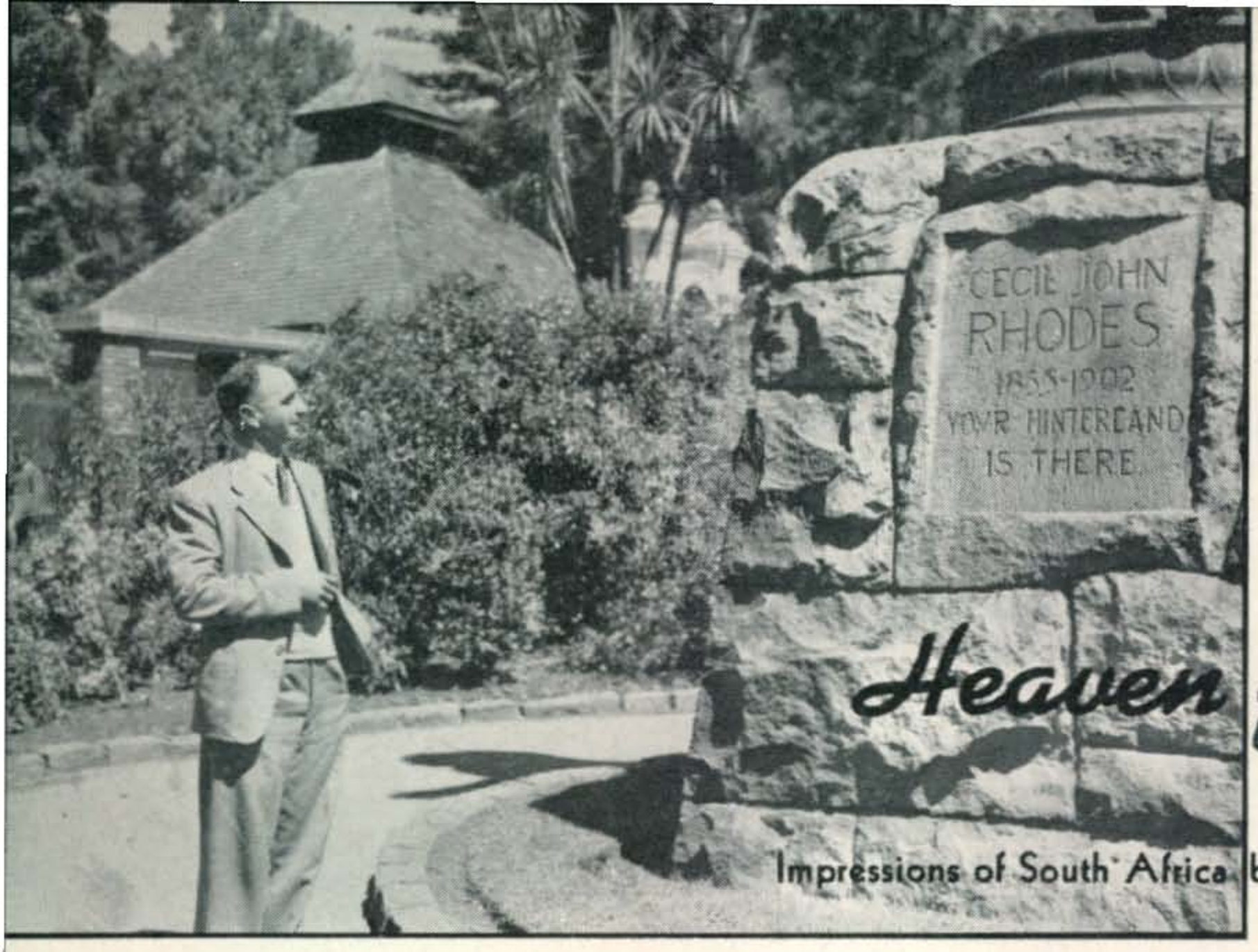


Fig. 5. Analysis of the most useful angles of radiation for a 1365 mile path.



ZS1M checking up on his QTH.

PAT MILLER, W2AIS*

Heaven for Hams

Impressions of South Africa by a refugee from W QRM.

TO HAVE A "ZS" the first ham outside the U.S.A. to enter the prized portals of W.A.Z. comes as no surprise to the author. A few weeks in South Africa visiting various ham shacks or listening on shipboard convinced me that South Africa is as near to a Ham Heaven as you can hope to find.

An azimuth map with Capetown as a center will show that the ZS gang are in a strategic location for knocking off DX. The rare stuff is either in their backyard or comes by a path seldom beset by magnetic storms. The hard-to-get DX for them is KL7, VE8 and, oddly, ZL on 14 mc. Otherwise the DX just pours in.

All That Glitters

However, all is not beer and skittles. "W" QRM is a major nuisance on 14 and 28 mc. 80 is useless for DX nine months of the year due to a high QRN level and 40, though a good band, is made nearly useless by Indian BC stations and those South American phones.

Naturally, the major portion of their DX comes from the U.S.A. and with it the QRM. Sitting in at ZS2AG one Sunday afternoon I nervously smoked cigarettes trying to subdue an itching keying finger while those rare PK and VS lads pounded in. 2AG paid little heed referring to it as being an average afternoon. (Average!) He preferred to sigh bitterly over the W QRM. I soon found he had a reason to be unhappy. We Yanks, except for W6 and W7 in the morning, do not come through until ten p. m. their time on 14 mc. But when we do, we set up a din that is impossible to describe. The W QRM is vastly different in quality on the other end. The main characteristic might be described as a three-layer pyramid. The top layer consists of about ten outstanding signals with the second layer containing about thirty more, still R5, but markedly down in "S" strength. The base or bottom layer is just a howling mass of indistinguishable signals, sounding somewhat like a bird house in a zoo. From time to time a signal will rise out of this bottom layer for a few minutes only to fall back into oblivion. This three-layer effect is very marked on 14 mc and to a lesser degree on 28 mc. Observations on 14 mc at ZS2AG, ZS2F, and on shipboard, and on 28 mc at ZS5CJ found it to be a consistent phenomenon. Most of the ZS gang agreed with me on this and we all wondered why some forty odd W hams stood out so markedly over the rest of them. However, the W.A.Z. honor roll would seem to bear this out. Taffy Boyce, ZS5CJ, a wise old sage, 63 years young, made the observation that I think may be the answer. He said, "I think most of you chaps are just pumping in power and paying little heed to efficiency of equipment and antennas."

The most consistent districts heard down there are W6 and W7, but the loudest signals come from the W1, 2, 3, 4 gang. 14 mc is hot for W6 and 7 from 0400 to 0800 GMT and 2200 to 2400 GMT with the rest of us heard well from 2000 to 2300 hours. 28 mc seems to be open to all districts at

ZS5GD, ZS5BY, ZS6KN, and SWL Mostert.

48 West 53 St., New York City.

once from 1200 to 1800 GMT with the band open on good days until 2100 hours. 40 does put in DX from 2100 to 2300 GMT and 0300 to 0500 GMT when the phones let up.

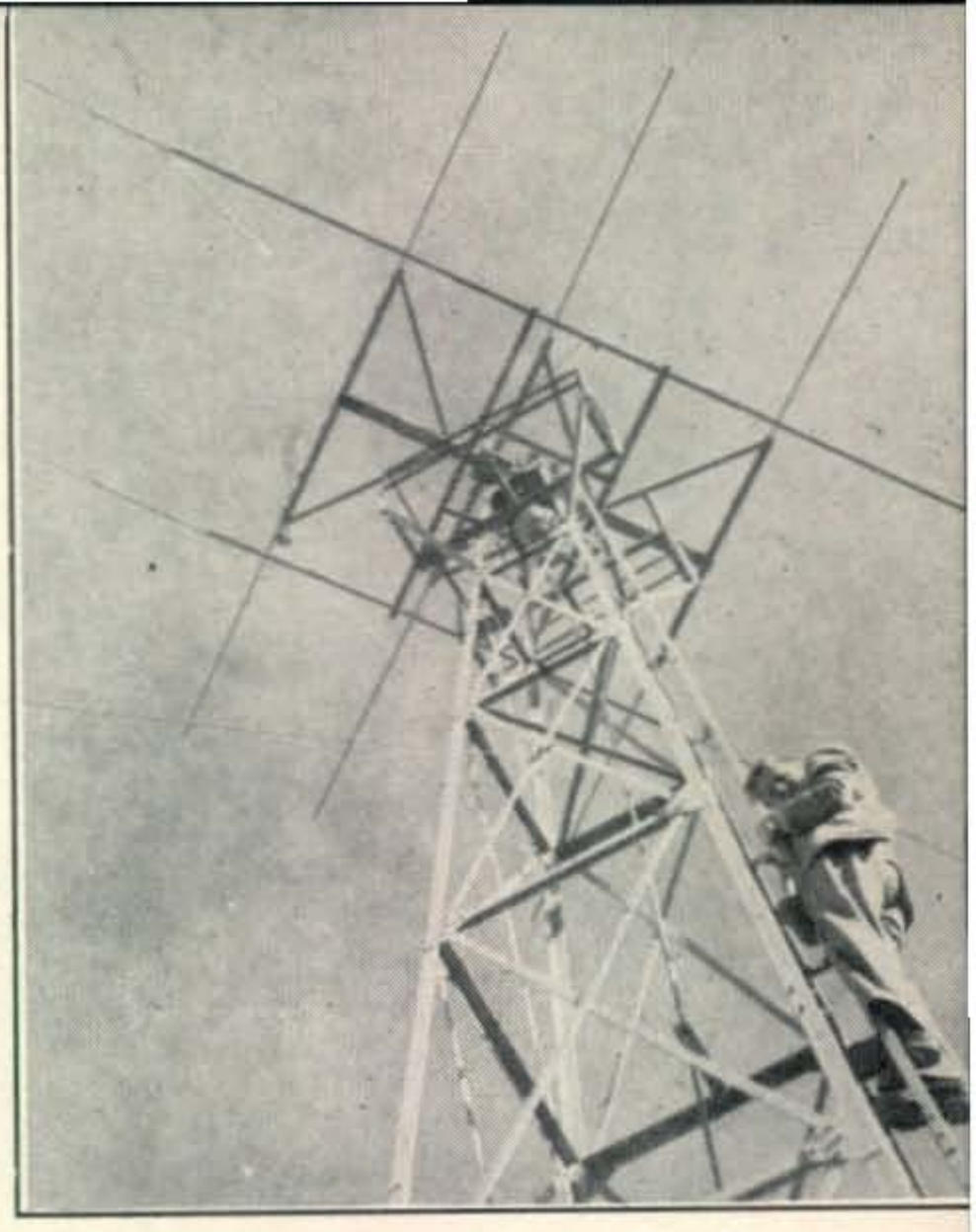
Sitting at the mike of ZS5CJ's 28-mc phone is a real thrill. On a Sunday afternoon we raised all districts in two hours without making any sustained or planned effort. 5CJ said it was an average afternoon for 28 when the band is open. He finds the rarest W is W7 but he still knocks off plenty of them. 28 seems to be open in some direction most of the year down ZS way and is a most popular band. One blight on this band is what 5CJ refers to as "KW Korner" (28.5 to 28.6). He urges all of you to shorten your beams and operate from 28.6 up. I can't say I blame him. KW Korner is just one mess of screeching heterodynes. Very few QSOs were made in this rat's nest of signals, and I noticed that 5CJ tuned QML. All the ZS 28-mc phone men I met said they were tuning away from KW Korner; so judge for yourself, gang, piling up like that doesn't pay.

Sixteen ZS hams from ZS1, 2, 5 and 6 were interviewed either in their homes or offices and the following opinion poll should be of interest. First, two criticisms of Yank operation. The most consistent complaint, and I found these polite people loath to complain, was the thoughtless habit of butting in on a QSO. I noted this to be true on both phone and c.w. The boys down there beg you to wait your turn. They wish to assure you that they listen after each QSO and ask you to wait until then. The second complaint is a more universal one, that of piling up your v.f.o.s on the DX man's channel. The first complaint shows lack of taste on the part of some of us, and the second one is just plain stupid operation. You only have to listen on the other end to realize it. So, gang, wait your turn and spread out.

Taffy Boyce, ZS5CJ, curator of the Durban museum.

Ninety per cent of the boys were in favor of an international ¼ kw limit with a very vocal minority plugging for the 100-watt limit in effect in South Africa.

All of the gang favor a strict segregation of phone and c.w. for all nations with common agreements, and some of them favor a further subdivision of the phone bands into U. S. A. and outside U. S. A. They



ZS2F looking down from his dual 10-20 array.

are madly in love with our equipment and general know-how, but frown on the tendency of some of us to buy ready-made shacks. They feel we should at least design our transmitters and antennas and build them.

Their main item of self-criticism is their poor quality of c-w operation. They put forward various proposed cures for this condition. ZS1M feels that the beginner should be made to stay on c.w. for at least two years before being allowed to build a phone rig. Mr. Heywood, ZS5BY, voiced the major opinion that third party traffic should be allowed, but he also felt that it was beyond hope of attainment due to the fact that communications of all types are run by the South African government.

The gear in use varies from the simple super gainer and 20 watts at ZS2F to ZS5BY's four-element beam, 813, panadaptor and BC-221 frequency meter. Beams are coming into vogue but their construction is limited due to acute material and labor shortage in this fast growing wonderful land.

When Not Hamming

South Africa is not only a heaven for hams but a land of great promise. Its climate is mild and varied, ranging from cool sea level Capetown and Port Elizabeth, to tangy mountain aired Pretoria and Johannesburg, to lush subtropical Durban.

Its cities are all proud possessors of clusters of skyscrapers in their centers with countless multi-storied business places spreading out into lovely attractive suburbs. Most homes are one story affairs quite like the stucco homes of Southern California.

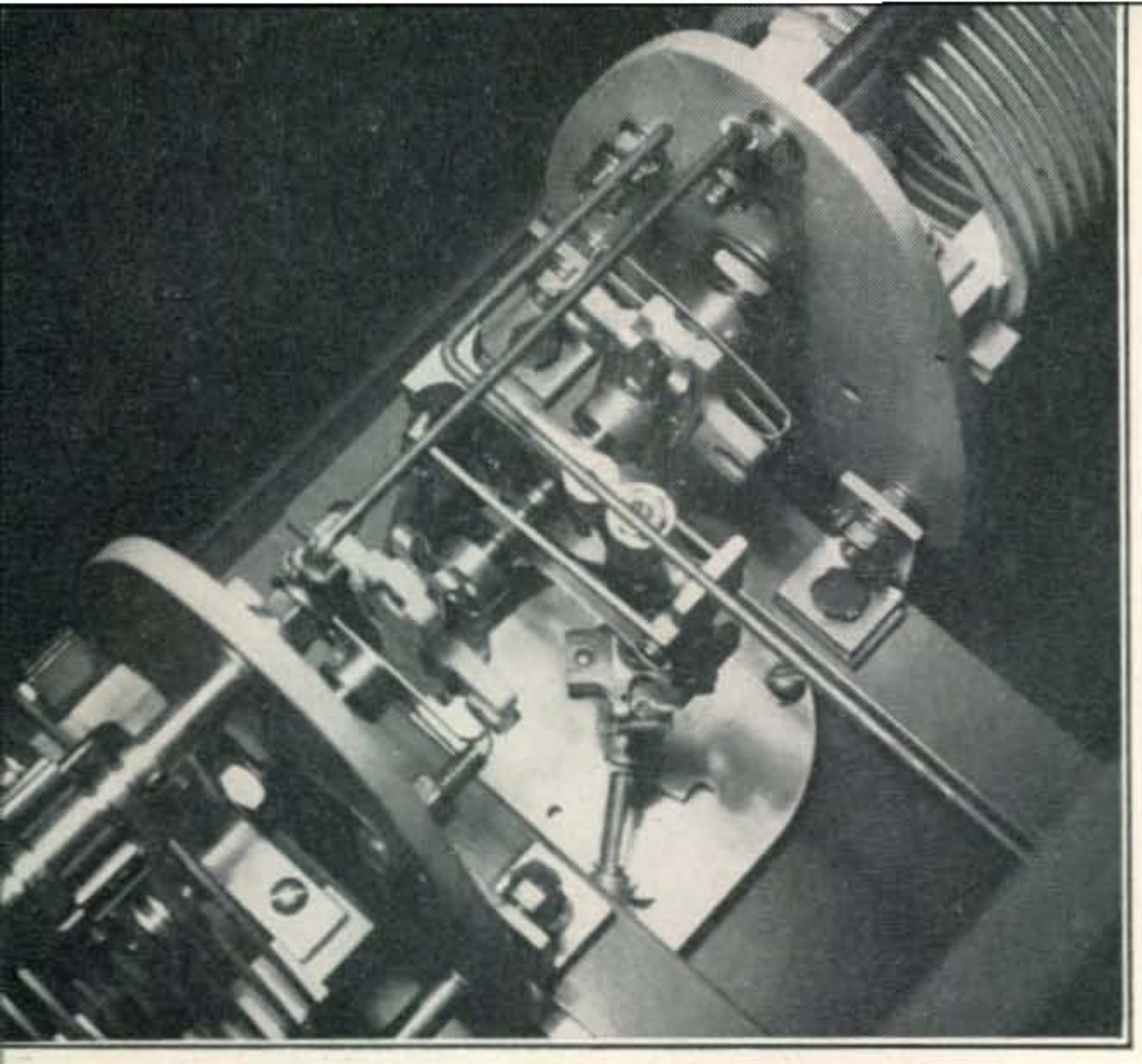
Capetown has two magnificent bays and countless thrilling seaviews topped off by a breathtaking backdrop of mountains with Table Mountain soaring into the blue forming the top peak. Durban, though less dramatic from a scenery point of view, has a delightfully lazy climate and looks like a cross between Miami and Los Angeles.

The ZS standard of living is slightly below that of the States as far as dollar value goes, but is really higher in the sense that the average man is better

(*Continued on page 108*)

DIRECTIONALS

C. F. BANE, W6WB*



"Round and round." Ganged roller coils, coupling and dial by E. F. Johnson, and right-angle drive by James Millen, are all standard components which can be worked into any amateur antenna setup.

Why rotate the rotary? Here's the germ of an idea for the antenna man who wants to do some original work on the ham bands.

THIS BRIEF ARTICLE is presentd with the hope that the material contained herein may suggest interesting possibilities for beam antennas, particularly those for use on the lower-frequency amateur bands. While the material to follow applies essentially to vertical types, horizontals are not at all inapplicable; it is merely that much of the initial design work was done for broadcast-band frequencies where verticals are conventionally used.

Most of the material appearing in the amateur literature on the subject of two-element verticals has been confined to the more simple examples where both elements are driven. For the in-phase condition, the pattern will be a figure-of-eight, the maxima of which will be perpendicular to a line passing through the two elements. For 180-degree phase difference, the pattern is still a figure-of-eight but with the maxima occuring at right angles to those produced by the in-phase condition. It is thus easily possible to change the direction of the major lobes by 90 degrees by simple switching.

Assuming that both lobes of the figure-of-eight, (with either broadside or end-fire phasing) are of equal amplitude, either system will be bi-directional and the front-to-back ratio will be unity. The familiar exception to this is when one of the elements is 90 degrees out of phase with the other. Here one of the lobes disappears or greatly diminishes to provide the familiar "cardioid" pattern. It is perhaps significant to note that with these better known systems we do things on an "all or nothing" basis. When we change the directivity of the system we do so by 90 degrees—really a radical sweep. Phasing, in turn, is nominally an exact 90 or 180 electrical degrees, again a big jump. The broadcast folks handle their vertical directionals in a very much different manner.

The present crowded condition of the standard broadcast band and the constant and ever-growing requests for new licenses has forced the use of directionals, not necessarily for the additional gain but rather for "protection" of the patterns of existing stations. The designers of these directionals must concern themselves with producing patterns that will afford maximum gain in their primary coverage area and at the same time introduce "rejection notches" in certain other directions. It is apparent that the better known figure-of-eight or cardioid patterns will normally fall short of fulfilling these complex requirements. In some actual cases it has been found necessary to employ as many as six elements to obtain power reinforcement simultaneously with very high rejection in several undesired directions. This is, of course, an extreme case, the multiplicity of patterns that can be produced with two elements is astonishing.

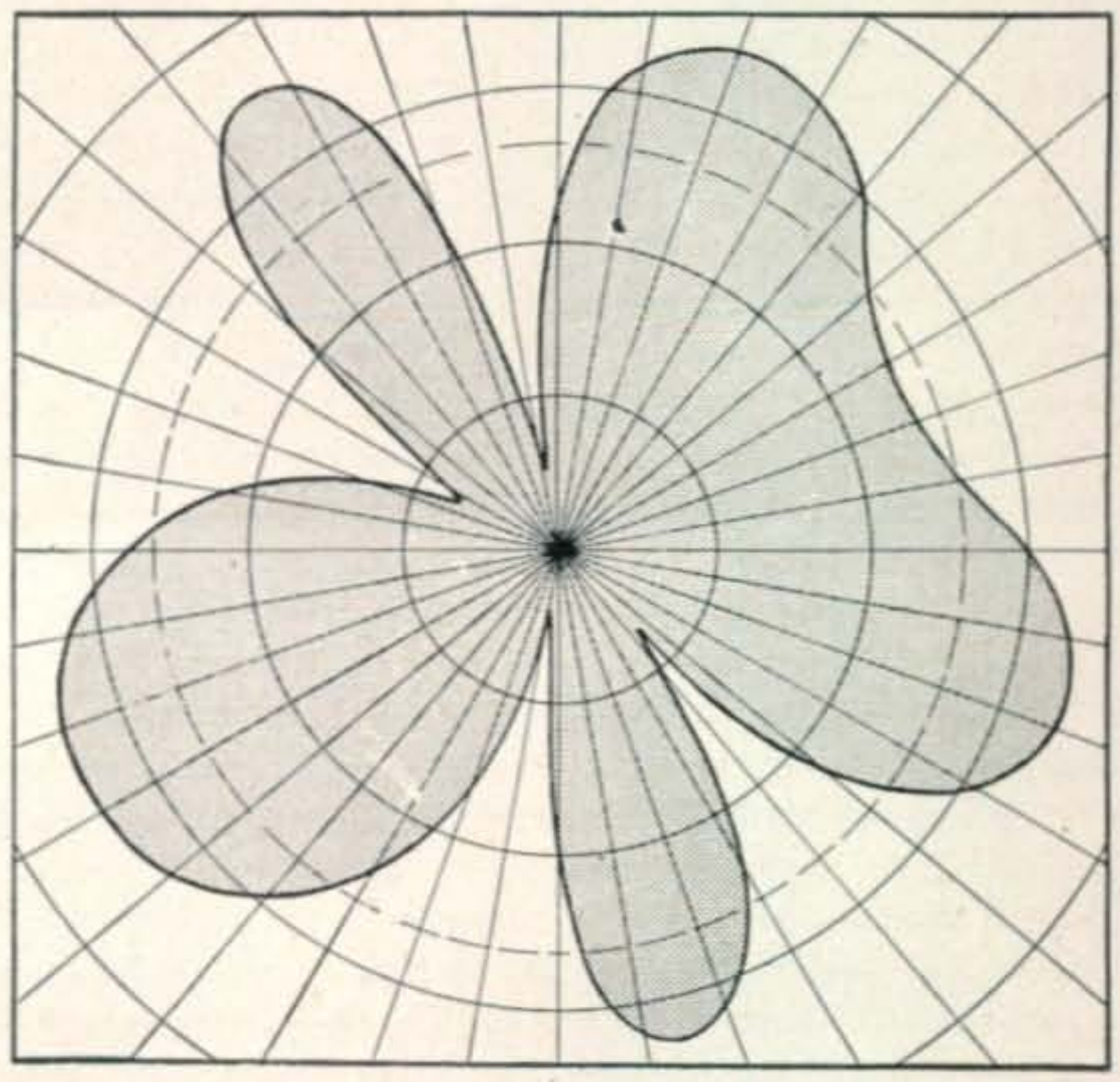


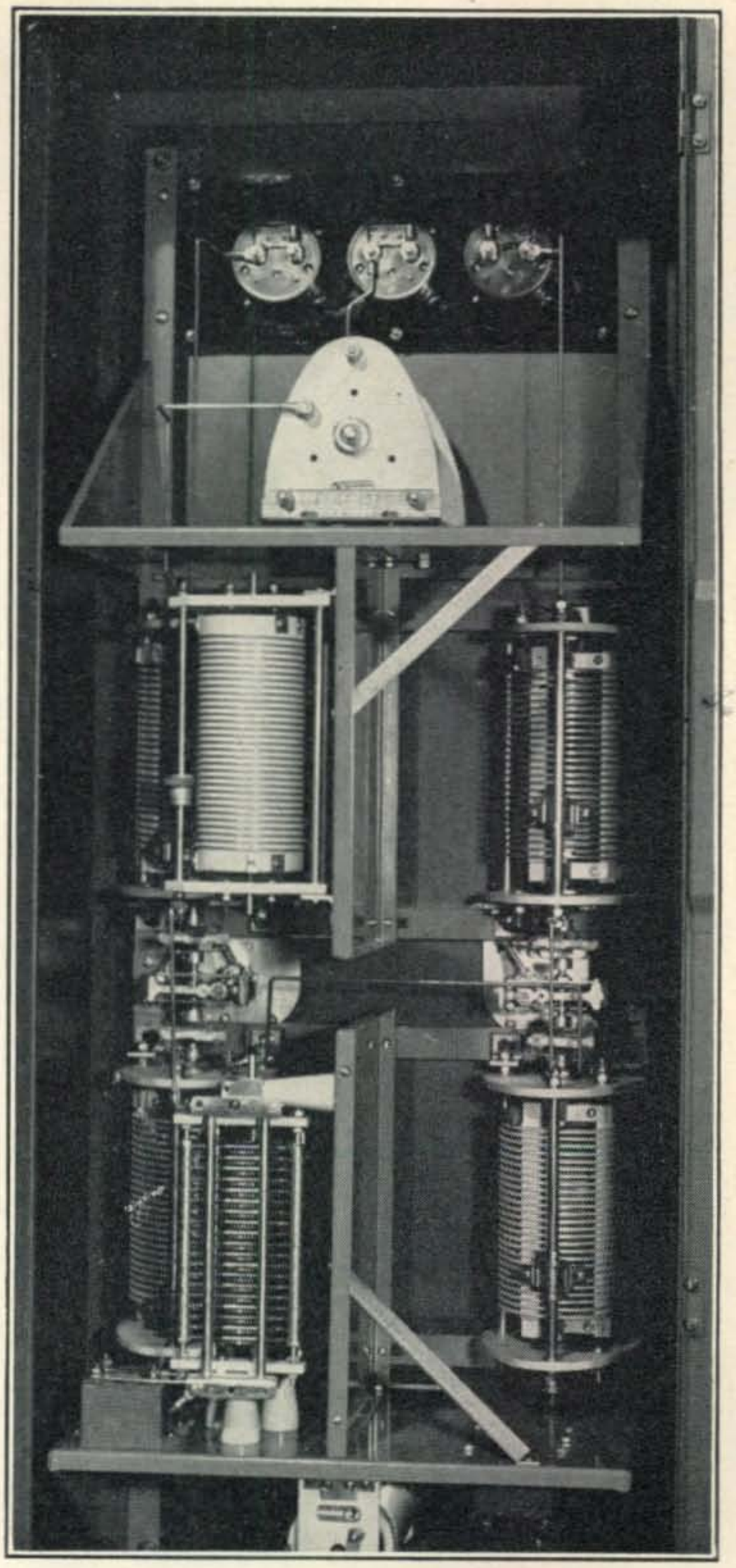
Fig. 1. Measured horizontal plane radiation pattern.

* *155 Saint Elmo Way, San Francisco, Calif.*

The polar diagram in *Fig. 1* may better serve to illustrate the fact that patterns radically different from figure-of-eight or cardioid are entirely practicable. The drawing represents an actual plot of the horizontal field pattern of a broadcasting station employing a two-tower directional and operating on a frequency near 1500 kc. It is interesting to consider the fact that patterns such as these are first theoretically predicted after which a practical antenna system must be designed which will produce a pattern in close conformity. In a two-tower directional (both towers of equal height) there are a number of parameters that can be altered to produce a given pattern. First, the spacing between the two towers will dictate the phase and magnitude of the current induced in one by the other; this effect being somewhat comparable to a multi-element beam with self-resonant, parasitic elements. Since the vertical elements are "driven" it is also possible to shift the phase in one of the towers by any desired amount by introducing suitable networks in one of the transmission lines. Additionally, power division networks can be used to vary the ratio of the currents in the two towers. The peculiar pattern shown in *Fig. 1* is thus produced as follows: The spacing between the two towers corresponds to approximately 400 electrical degrees or just slightly greater than one wavelength. The current in one tower *leads* that in the other by 60 degrees and the current in this latter tower is less than that in the other by a ratio of 1.7 to 1.45 amperes. With a complex, multiple-lobe pattern, one would not expect appreciable power gain over a single vertical radiator and such proves to be the case; here the maximum increase is slightly less than two-to-one. To the writer's mind at least, the significant thing about this pattern has nothing to do with gain but rather in the fact that four deep nulls are in evidence. It is interesting to consider the possibility that the position of these nulls might be changed by adjustment of phase and of current ratio.

Commercial Prototypes

The photographs are of the actual unit used to produce the pattern in *Fig. 1*. Bear in mind that this particular equipment is for broadcast band operation on a fixed frequency and is far more elaborate and complicated than would be necessary if it were to be used in amateur service. Briefly, the case houses a power dividing network (used to establish the ratio of the currents in the two elements) and a phase-shifting network to set the phase of the transmitter to one of the towers. This latter network is in the configuration of a "T"; the series arms being two roller inductors ganged together while the shunt arm is an independently tuned inductor in series with a fixed capacitor. In this regard, it is more or less standard broadcast practice to use variable inductors instead of variable capacitors due principally to the inordinately large physical size of the latter at broadcast frequencies. From an amateur standpoint this unit will be of no more than passing interest except that it may suggest some constructional ideas. The method and mechanism for ganging the roller coils is noteworthy, being accomplished entirely with standard available components. The

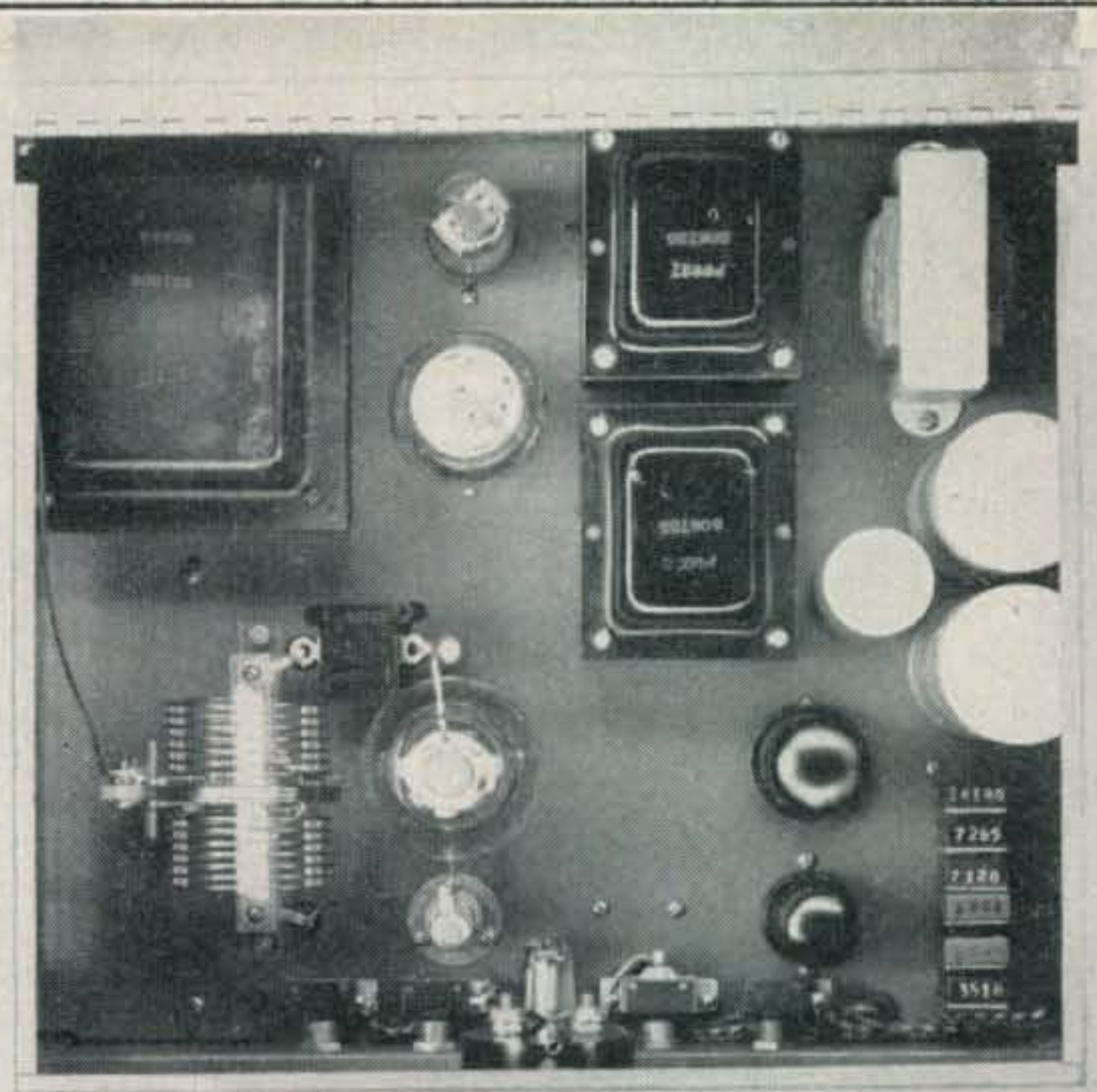


Rear view of phasing unit. Ganged roller coils on the right are the two in the series arm of the phase shifting network. The roller inductor at the center bottom is in the shunt arm of the "T" network. Other inductors are either for power division or reactance cancellation. The three meters at the top indicate total current, current in east tower and current in west tower.

unit was engineered and put into operation by Melvin P. Klein who is likewise responsible for the field strength pattern shown. Mechanical design and construction was done by the writer.

In attempting to evaluate the possible advantages of a complex pattern such as that shown, one should not lose sight of the fact that the plot represents readings taken on horizontal radials run from the center of the system. This pattern is thus at zero

(*Continued on page 107*)



Stancor ST-202-A is a completely pre-fabricated 125-watt all-band c-w transmitter.

The New Look

Some of the latest commercially designed amateur transmitters.

YEARS AGO many amateurs began to recognize the almost insurmountable difficulties connected with the building of communications receivers equal to the commercial product, with the result that nowadays practically everyone on the air uses a commercial receiver. Amateur transmitters over the years have similarly developed from the homespun breadboard variety to rigs either commercial in appearance or commercial throughout. This month, to keep everyone abreast of the latest in transmitters, *CQ* looks at several of the newer marketed units ranging from the tiny but husky Millen 90811 10–11, 6, and 2-meter final amplifier to the flexible Temco RA series.

Millen 829-B PA provides output on 10-11, 6, and 2.

Millen 90811 High-Frequency Transmitter

One of the hottest high-frequency tubes on the market these days is an 829-B, the popular twin pentode r-f beam power amplifier. Perfectly suited for push-pull operation, the 829-B can handle 150 watts input, delivering a good 75 watts output as a c-w or NBFM amplifier. The Millen 90811 transmitter, shown in *Fig. 1*, consists of a complete push-pull final for the 10–11, 6, and 2-meter bands, constructed on a small sturdy copper chassis. Provisions for quick band shift are made by means of the new Millen 48000 series of high-frequency plug-in coils. Two coils are used for each band, a fixed link-coupled grid circuit and a swinging link final tank respectively. About one watt of grid drive is sufficient to secure full transmitter output on any of the three bands. Provisions are made for a key, grid and plate current meters, and an AM modulator connection as well as power input leads. In the photograph, the two "feelers" atop the unit are neutralizing "condensers" which arrive from the factory correctly tuned. During tests on the equipment, it was observed that at the full 829-B power input, the tank coil heated up only moderately.

◆ ◆ ◆

Stancor ST-202-A Radio Transmitter Kit

Many fellows enjoy assembling their rigs from materials supplied in specially designed kits. The Stancor ST-202-A kit requires only assembling and wiring to become a complete medium power c-w rig, the dirty work of sawing metal and drilling holes being conveniently taken care of by the manufacturer. *Figure 2* shows the unit with all the operating controls. Circuit-wise, a 6V6 Tri-tet crystal oscillator, having provisions for switching six crystals, starts off the tube line-up, followed by an intermediate 6L6 amplifier. To simplify the transmitter, a clever circuit arrangement is used which permits the use of only one common set of band-switching coils for both the oscillator and the intermediate amplifier. Either a 35T, 35TG, HK54, 811 or 5514 triode may be used in the single ended neutralized final amplifier stage. Keying is accomplished in the screen circuits of the first two tubes, while metering is inserted in both the grid and plate circuits of the final by switching. Two integral power supplies complete the circuit description, one delivering 350 volts to the low power stages and the other, 1,000 volts to the final, both at 125 ma. On the air, the rig will handle about 125 watts input on 10–11, 15, 20, 40, and 80-meter c.w. NBFM or AM phone may later be applied by means of external modulation equipment whenever desired.

Temco RA Series Transmitters

For amateurs desiring exceptionally well designed commercial-type equipment, Temco markets a complete line of medium and high-power transmitters assembled in unitized construction so that one may equip a station with one of several basic units and add such matching additions as desired. The Temco RA series enables an amateur to assemble one of 16 different type transmitters from a group of 14 different sectional chassis units, starting with the basic 150-watt c-w unit. Other units may be added to boost the input power to 1 kw and also to add v.f.o., NBFM or AM phone, or any combination of facilities as desired. Each chassis rolls into the main cabinet on deck guide rails, plugging into power and interconnecting cables automatically at the end of travel. All cabling throughout the cabinet is factory installed, so that no additional work is necessary to add another unit into the system, except tuning-up. The 1-kw final amplifier, using two 250-THs in push-pull, is AM modulated by a pair of 100-THs and is excitable by any combination of the lower level

Temco RA series is deluxe custom-built kilowatt.

units just mentioned. The great advantage of the unitized style of construction is the removal of the threat of obsolescence of an entire expensive investment. New developments in circuitry may be added to the Temco units from time to time with a minimum of expense. Similarly, only a moderate investment is needed to get on the air with the basic unit, and other units may be added whenever the exchequer allows, without losing the first initial investment.

Postscripts

ROTC Station

WØDSF is the station of the Dept. of Military Science and Tactics at the University of Minnesota. It went on the air in Aug., 1947, and its trustee is M/Sgt. Art Monsees, W6HJP. Equipment is a Harvey 100T transmitter driving a pair of 250THs with 1 kw input on 20 meters. Receiver is a 400X Super-Pro.

W6HJP is communications instructor for the ROTC at the University, which is one of 79 colleges and universities offering a course in air communications under the expanded Air Forces program. Graduates receive commissions as communications officers in the Reserve Corps of the USAAF, and many are accepting a year of active duty to round out their education.

Key Clicks

In the article, "A Modern Receiver for the Beginner," *CQ*, Feb., 1948, page 24, *Figs. 1* and *2*, *L2* should have been specified as a 500-hy screen grid choke, and *L3*, a 10-hy "a.c.-d.c." filter choke @ 55 ma, 350 ohms d-c resistance.

Monthly DX Predictions-April

OLIVER PERRY FERRELL*

CONSIDERABLE INTEREST is evidenced each month when the "provisional relative sunspot numbers" become available. By averaging the new value with those of the preceding eleven months it is possible to obtain a running average value that will show the epoch of the sunspot peak. The decline in sunspot numbers during December foretold that the sunspot peak had probably occurred in April/May of 1947. However, the January, 1948, number was somewhat higher than the value for January, 1947, and at this writing indications are that the epoch probably peaked during May/June, 1947 and the record may have been June, 1947.

It is rather fascinating to consider that that period is very close to the one predicted as the maximum by various authorities. Thus, we are gaining more concrete evidence that the riddle of the sunspots will and can be solved. If the peak month is, as now indicated, to be June, 1947, it will be equal to the previous record in sunspots recorded in 1778.[1]

The decline in sunspot numbers is generally rather slow in comparison to the rapid ascent and the number may well remain sufficiently high for the next 18 to 24 months to ensure good conditions on 10 meters. It is doubtful that we shall ever see any more of the long range F2-layer DX on 6 meters since the sunspot number next Fall will preclude a sufficiently high MUF over either North Atlantic or the trans-continental paths. It is noteworthy, on the other hand, that 10-meter DX conditions next Fall and Winter will be much better than they were during the past 1947/48 season.

The prediction graphs each month show the predicted maximum usable frequency (MUF) as based upon currently available ionospheric information. The MUF is the variable function indicated by the single line. The shaded area in each graph shows the span of unusable frequencies calculated on the basis of an effective radiated power of 1000 watts. For weak signal c-w work it may be found that the value of indicated LUF is too high, although for phone work the value may not be high enough. The value of LUF given is arbitrary phone-c.w. work at a better than average location with excellent receiver sensitivity.

Graph 1 illustrates the MUF and LUF over a path from the W1, W2 and W3 call areas to South Africa. The shaded absorption area shows why the 10-meter band opens and then appears to close during the morning hours. The first 10-meter opening is predicted to occur around 0615 hours EST—the opening lasting until about 0700 hours. The band is then closed until 0915 while possibly remaining open until 1630 due to the high MUF in the southern hemisphere. The 20-meter opening will probably start around 1415 hours EST with this band closing about 0230 hours EST the following day. Some 40-meter signals may be expected after 1630 hours EST lasting until 0130 hours EST the following day. No amateur band is open over this path from 0245 hours until 10 opens briefly around 0615 hours.

The prediction graphs are particularly valuable in working out paths such as the one illustrated this month as *Graph 2*. This is drawn for the W6-W7 call areas to the area around the Malay States. A variety of short openings are predicted on all the DX bands. 40 meters will probably be open from 0230 to 0645 hours PST. It may, however, be difficult to work across this path due to the high static level on these frequencies in the Far East. 20 meters may open around 0045 hours PST and remain open throughout the early morning hours closing shortly before 0930 hours EST. Peak conditions are to be expected from 0715 until 0900 PST. Once again several 10-meter band openings are predicted. The first one lasting from 0945 until 1215 hours PST. The band will then be closed until 1515 hours when it should reopen until absorption sets in before 1700 hours. Signals will be very weak until 1845 hours when conditions will probably improve, remaining fairly good until 2015 hours PST.

Graph 3 shows the relatively stable conditions expected on the north-south paths from Argentina to the United States. The peak MUF will be about 36 mc. The 10-meter band will open around 0645 hours CST and close after 1745 hours CST. Best 10 meter conditions are to be expected after 1530 hours. The 20-meter band is predicted to open after 1615 hours CST, remaining open during the evening and closing between 0500 and 0600 hours the following day. The absorption rate indicates that this band may open around 1800 hours although the static level may be sufficiently high during this season to prohibit good contacts on this band.

Graph 4 illustrates the predicted conditions across the North Atlantic path between the W8, W9 and WØ call areas to the Mediterranean countries near Italy. The curves show that the MUF should be less than 28 mc during most of this month indicating that no regular 10-meter opening can be forecast. 20 meters may open for a short period between 0330 and 0430 hours CST. The principal opening, however, is from 1330 hours until 0130 hours CST the following day. Particular emphasis should be placed on the conditions between 1800 and 2030 hours CST. The 40-meter band will probably be open from 1715 hours with weak to fair signals until 0100 hours the following day. Good to fair 40-meter conditions from 2000 until 2300 hours CST.

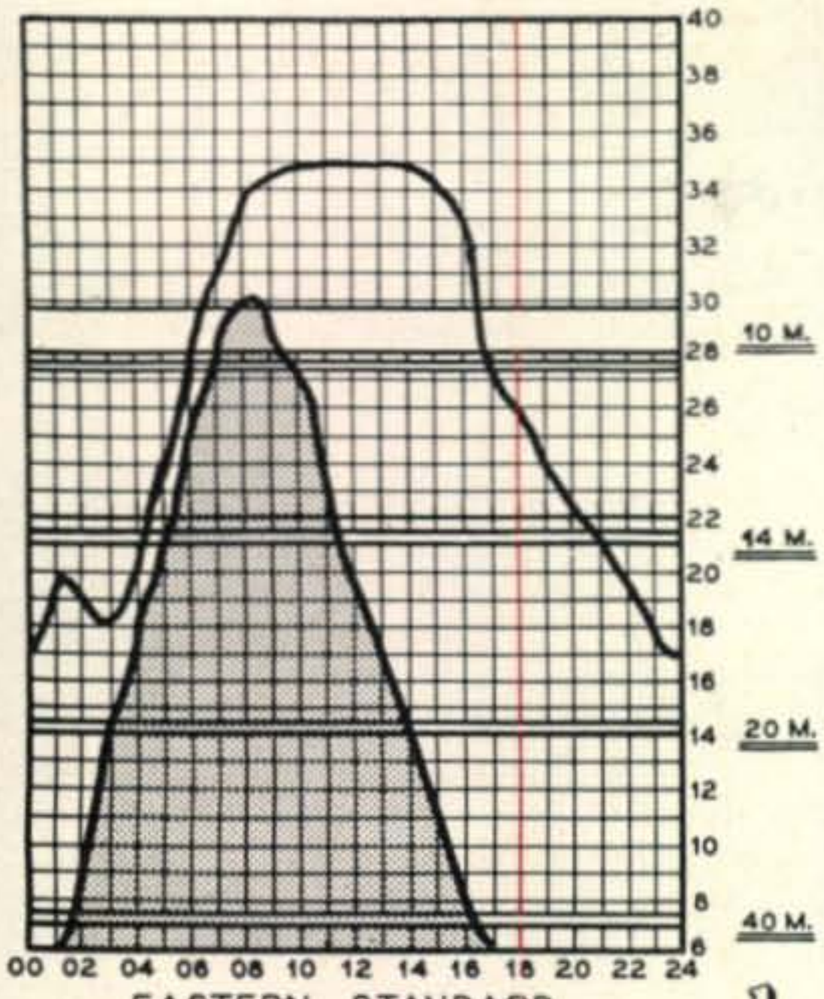
Little ionosphere storminess was observed during December and January. This was in part normal for this time of the year, although it had been predicted that numerous storms would be observed in the latter part of January and the first part of February. At the present time it is difficult to make an accurate forecast, although there is some indication that ionosphere storms will occur during the periods: April 1–3, April 8–10, and April 24–26.

The data for the preparation of the MUF curves is derived from the booklets issued by the C.R.P.L. of the National Bureau of Standards entitled "Basic Radio Predictions Three Months in Advance." These are available on a subscription basis from the Superintendent of Documents, Washington 25, D. C.

*Assistant Editor, CQ.

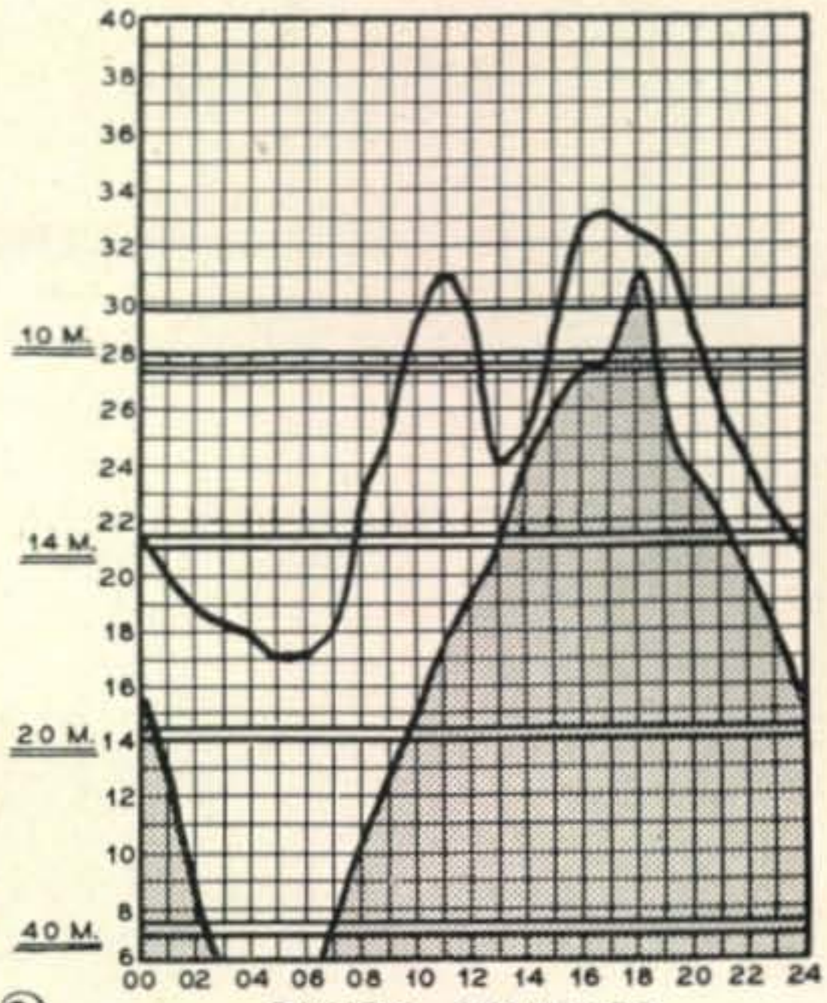
[1] Reliable sunspot data begins around 1749, although as a matter of historical interest there are observations recorded by Chinese astronomers in 28 B.C. Most of our present-day knowledge is based upon the work of the Swiss astronomers, Wolf and Brunner. The sunspot number is obtained by taking ten times the number of sunspot groups plus the number of individual sunspots observed. These are then multiplied by a factor depending upon the conditions of observation.

Monthly DX Predictions

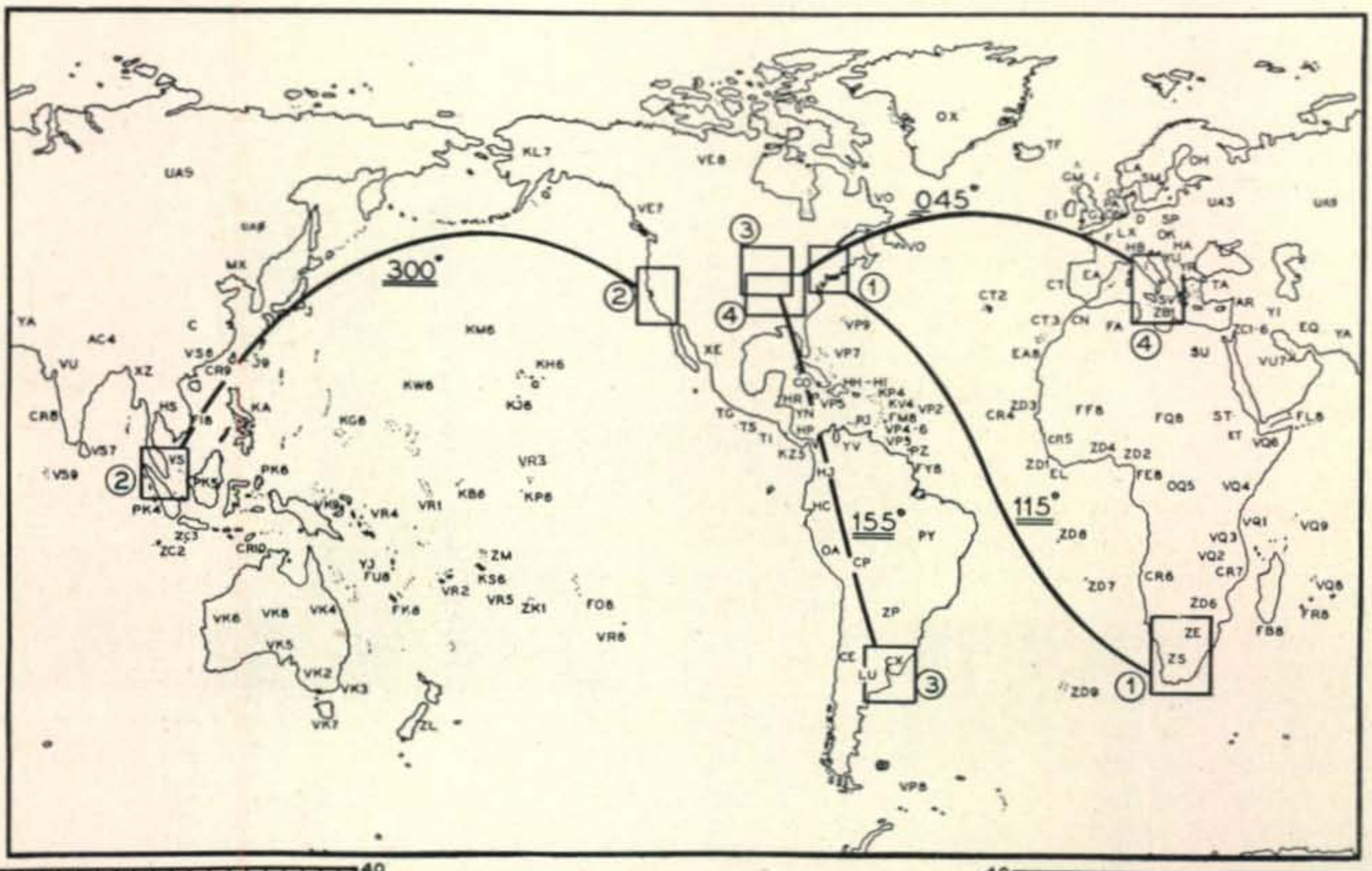


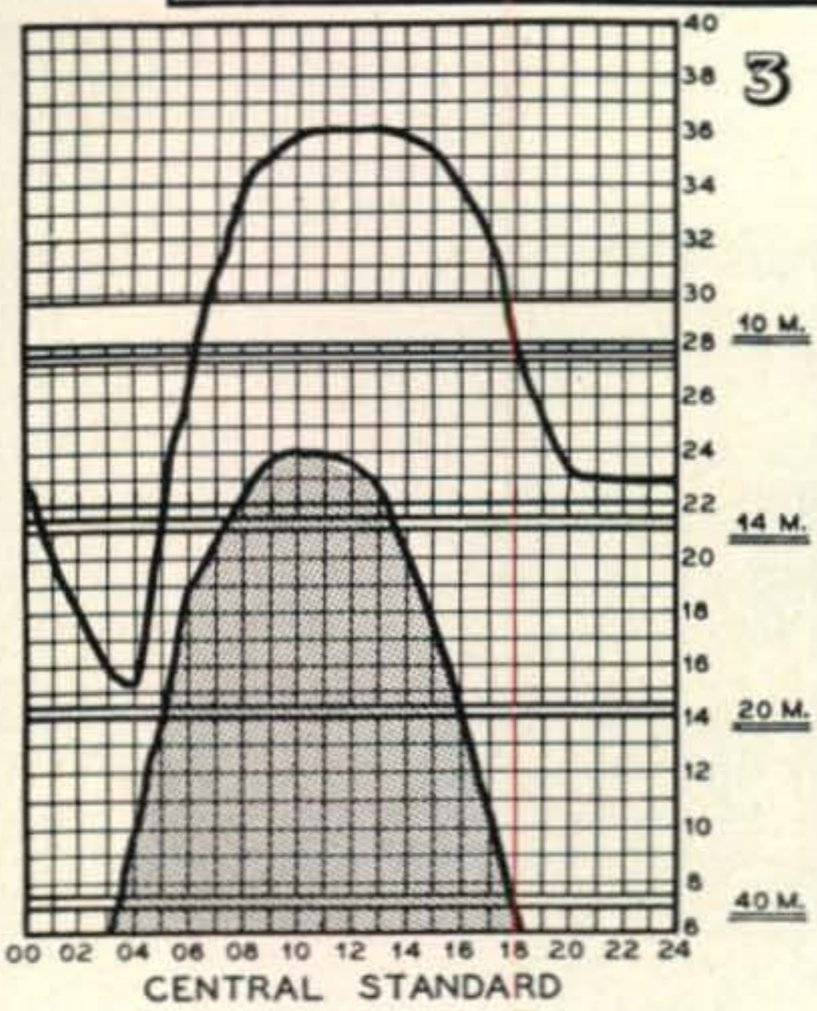
1

Maximum Usable Radio Frequencies—Charts show the maximum usable frequencies propagated by the F2-layer over the paths indicated in the world map. The abscissa shows the local standard time at the point of origin of the path. The ordinate shows the frequency in megacycles. Amateur frequencies fall within the two heavy parallel lines that indicate the upper and lower limits of the principal bands.



2



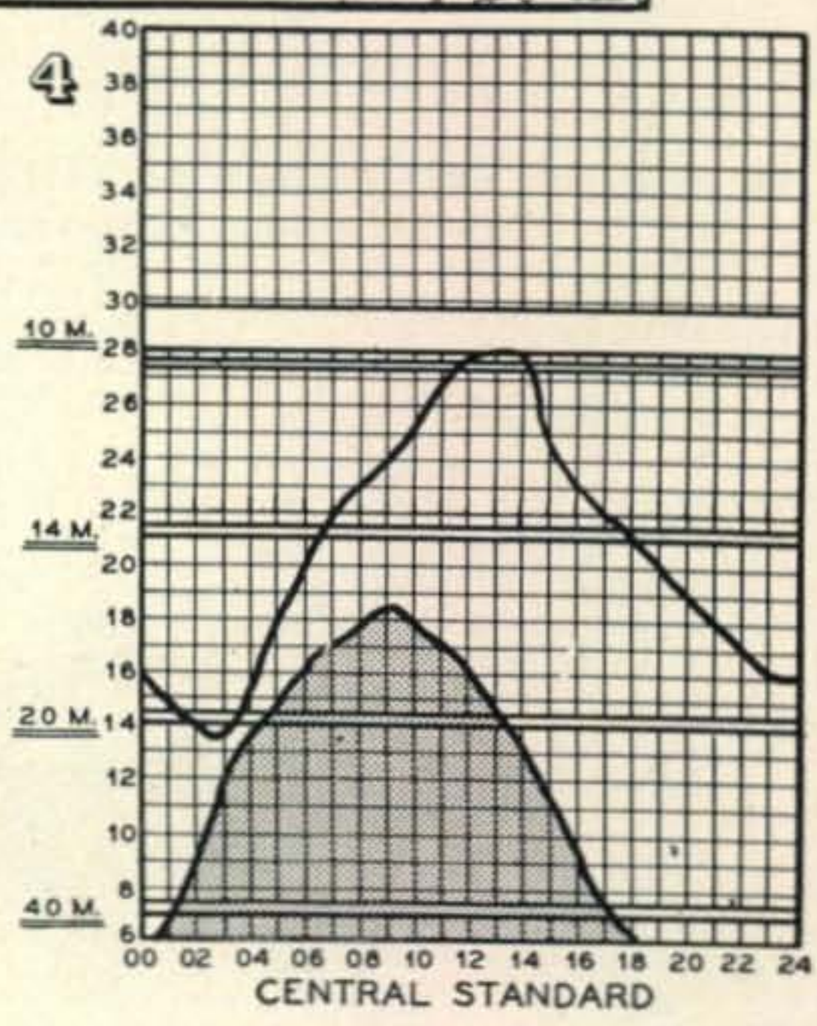


3

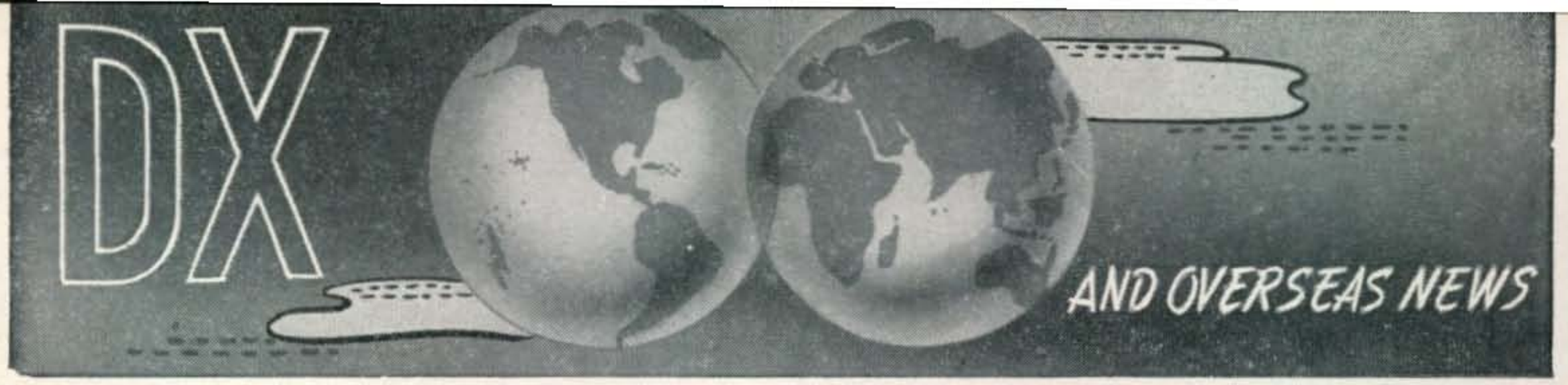
Lowest Usable Radio Frequencies—The shaded area in each chart indicates unusable radio frequencies for the illustrated path. The LUF is calculated for an above average amateur location using a good communications receiver. The effective radiated power is assumed to be 1000 watts. The LUF is based upon average monthly signal absorption and does not include the effects of abnormal or auroral zone absorption.

Azimuth—Radio transmission is known to vary considerably with geographic latitude and longitude. Each path MUF and LUF as illustrated is calculated for the "short-path". This is the path shown in the map.

Variations in Forecast—All graphs are monthly predicted average conditions. On ionospherically "quiet" days some variation amounting to less than 15% may be expected. However, a value representing 0.85 of the MUF will be exceeded over 90% of the total time. The graphs do not indicate radio propagation conditions during ionosphere storms or sudden ionosphere disturbances. They are not adjusted for the effects of sporadic-E layer formation or long and short scatter. Radio disturbances of the ionosphere storm type are the most severe for paths which pass through the auroral or polar regions, the effects gradually tapering off towards the equator.



4



Conducted by HERB BECKER, W6QD*

THE 1948 DX MARATHON appears to be off to a flying start. A glance at the Marathon scores will show you we have picked up quite a few entrants over those listed in last month's column. A couple of local stations happen to be leading the entire pack, at this point, W6ITA with 38Z and 106C, while W6DI has 33Z and 89C and heads the phone-only section. Over the next few months, these Marathon totals will, no doubt, take on an aspect of a little more world-wide participation. Some of the local W6s have really been putting on the heat, and since they are local, their totals represent stuff that they have worked right up to the last minute. Some of you guys who are scattered around the world, as well as in other parts of this country, have a slight disadvantage in the recorded totals due to the time taken up in the mails. That is why, over the next few months, I look for the DX Marathon to show totals which are more equal. You will find complete information on what you should do to enter the Marathon in a separate box in the column. There are a couple of points I would like to stress right now, however. One is, in order to receive credit, claims sent to us for zones and/or countries must be postmarked within sixty (60) days from the time of the QSO. As you can see, this will assure listing of the current monthly scores in *CQ*, as well as eliminate surprise last-minute entries. You might spread this word around to any of the other boys you happen to know who are in the Marathon. One of the best ways to avoid having any of your claims ruled out by the committee, because of your QSOs being beyond the sixty-day period, would be to mark a date on your calendar, and, in this way, it would remind you to send in your additions to us once a month. Since my closing date is the 15th of each month, you should time this "reminder" enough ahead of this date to assure it reaching me in time.

Within the next month or two, when we get a few more entries in the Marathon, we are going to show the scores by zones. As you know, the awards will be given to the high man in each zone.

W.A.Z. For W6YZU, W6FHE, G2PL, W6AMA

W6YZU can claim the distinction of being the first YL to be awarded a W.A.Z. certificate. She is Naomi Turk, none other than the XYL of W6LEE. To W6YZU goes certificate No. 17, and the Honor Roll will list her at 40Z and 129C. Certificate No. 18 is awarded to W6FHE, Kenneth Moon. Kenny's Honor Roll standing is 40Z and 152C. To G2PL, Peter Pennell, goes the honor of being the first "G" station to be awarded a postwar W.A.Z. certificate. Peter really worked for this one, as he sent us two cards for Zone 30 by mistake and none for Zone 29. By the time he was notified, and he sent through a card for VK6SA, we had lost a couple of months, and yet he is the first G station to make the grade. To G2PL goes certificate No. 19. A glance at the Honor Roll will show him tied for second place with 40Z and 185C. W.A.Z. certificate No. 20 goes to W6AMA, Dwight Querry, and his Honor Roll totals are 40Z and 165C. I might add that all three of the above W6s were anxiously awaiting receipt of a card from C8YR to make their 40th confirmed zone. As a matter of fact, a card from C8YR was the next to the last one received by G2PL to replace C6HH. It seems like C8YR has been good to a lot of these W.A.Z. aspirants. Our heartiest congratulations to all of the above on achieving W.A.Z.

A rare postwar catch, Robert Martinon, FM8AC.

Now, let's see what we can dig out of the mail bag in the way of gossip. For one thing, *ON4JW* says that many of the Ws plead with him for QSL cards, and that he QSLs 100%, but he only receives 50% in return. It looks as though he probably will wait for incoming QSL cards before putting his in the mail. From *OU4JW*, we also hear that all prewar amateurs in Belgium have been asked to take another examination before their licenses are renewed for 1948.

From *ex-KS4AE*, we learn of a very interesting incident that happened while he was on Wake. During the month of December, one of the Pan American employees became very ill. The medical man, normally stationed on the island, was absent, due to


A good neighbor in every DXer's log, Sergio Aguirre, CM2SW.

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

W. A. Z. HONOR ROLL

C. W.-PHONE

W6VFR	**40**	**189**
G2PL	**40**	**185**
W8HGW	**40**	**185**
W2BXA	**40**	**182**
W6PFD	**40**	**180**
W6ITA	**40**	**179**
W6MJB	**40**	**178**
W6ADP	**40**	**172**
W6SAI	**40**	**172**
W6SA	**40**	**170**
W6AMA	**40**	**165**
W7FZA	**40**	**161**
ZS2X	**40**	**159**
VE7ZM	**40**	**155**
W6FHE	**40**	**152**
W6LEE	**40**	**150**
W6WKU	**40**	**149**
W6LER	**40**	**140**
W6YZU	**40**	**129**
W6TI	**40**	**127**
W8RDZ	39	184
W2GWE	39	182
G6ZO	39	180
W3BES	39	178
W6ENV	39	175
W5ASG	39	174
W8BKP	39	170
W4CYU	39	170
W9ANT	39	170
W2HHF	39	169
W3JNN	39	166
W6PCS	39	164
W2PEO	39	163
W6DI	39	162
G5DQ	39	160
WØYXO	39	160
W6EBG	39	160
G8KP	39	156
W6SN	39	155
F8BS	39	153
G6QB	39	152
WØGKS	39	152
G5YV	39	151
G2AJ	39	151
W8NBK	39	151
W6KRI	39	151
W2COK	39	150
WØNUC	39	150
VK2DI	39	150
G2WW	39	147
W7BD	39	147
D2KW	39	147
W8LEC	39	146
W6TT	39	145
WØNTA	39	145
W9IU	39	143
W6ZCY	39	143
G3DO	39	141
W9DUY	39	141
G6BQ	39	140
W6GDJ	39	140
G3FJ	39	139
W2MEL	39	139
W6OMC	39	138
W3JTC	39	138
W6BAM	39	137
VE7HC	39	137
ON4JW	39	136

C.W.-PHONE

CE3AG	39	135
W6RDR	39	134
W6AM	39	134
W6BPD	39	134
VK2ACX	39	133
W6KUT	39	133
W6NNV	39	133
G5RV	39	132
G2VD	39	132
G2CDI	39	132
G2FSR	39	130
W9NRB	39	126
G5BJ	39	126
G3AAM	39	126
W7BE	39	125
G5VU	39	124
W6EAK	39	123
G3AAK	39	122
W6ANN	39	121
G5WM	39	120
G8RL	39	120
G6BS	39	117
G3QD	39	116
G3TK	39	114
MD1D	39	110
OK1AW	39	110
W6QD	39	109
W6UZX	39	109
W7GXA	39	106
W7ETK	39	105
KG6AL	39	103
W6EPZ	39	101
W6AX	39	93
G6PJ	39	76
W2CYS	38	144
W8FJN	38	144
W3GHD	38	142
W9RBI	38	142
W2HZY	38	140
W3EPV	38	140
W1NMP	38	140
W3EVW	38	140
PY1DH	38	138
W1JYH	38	138
W2IOP	38	137
W4BRB	38	133
W8CVU	38	133
G8IL	38	131
W4INL	38	131
G5CI	38	130
W3IYE	38	130
W3ZN	38	128
W1ZL	38	128
G6LX	38	126
W2RDK	38	124
GW3AX	38	123
WØSQO	38	123
W9YNB	38	117
W2PQJ	38	117
W6RM	38	114
W5CPI	38	113
W9VNB	38	113
OK1CX	38	110
VR5PL	38	109
G3Z1	38	107
G8IP	38	105
W6LEV	38	79
G3BI	38	75

C.W.-PHONE

W3DKT	37	136
W1BIH	37	134
KP4KD	37	128
W4OM	37	126
W2TJF	37	122
W1KFV	37	121
G4CP	37	117
W3KDP	37	115
W4ML	37	113
WØOUH	37	112
W9MZP	37	111
W4FPK	37	110
G4AR	37	108
VE1EA	37	107
G5MR	37	100
W2BLS	37	100
W6PQT	37	100
G3AAE	37	99
W8WWU	37	99
W2SGK	37	95
W8VLK	37	95
W6LN	37	82
W2CWE	36	128
W2PUD	36	128
W2RGV	36	119
SV1RX	36	119
W3ZN	36	119
MD5AK	36	118
W9LNM	36	116
W6RW	36	116
G2CNN	36	114
G2AKQ	36	112
W9TB	36	101
W5BK	36	101
W2CNT	36	100
WØAZT	36	100
G2AO	36	100
G6WX	36	95
GW4CX	36	92
W9FKH	36	91
W6PQT	36	90
W4MZ	36	89
W7EYS	36	87
W8HSW	36	85
GM2AAT	36	75
W2DYR	35	110
W8REU	35	104
G8VR	35	100
VE3AAZ	35	99
W6YYW	35	92
W7BTH	35	91
G2AVP	35	89
W6DLY	35	89
W9FNR	35	85
D4ANM	35	80
G8RC	35	78
G3BDQ	35	74
CM2SW	34	132
W8AVB	34	105
G8QX	34	99
W9WCE	34	97
G8KU	34	96
VK4RC	34	91
W3JKO	34	91
G6XX	34	89
W6LRU	34	87
W4DIA	34	86
W2JA	34	84

C.W.-PHONE

W6MI	34	84
D4AVE	34	81
D4ANM	34	77
W2EMW	34	77
J4AAK	34	66
W6BIL	34	63
W7FNK	34	54
W2ZW	33	115
W4QN	33	94
W4HA	33	94
W6ZZ	33	91
W3AYS	33	88
G2LC	33	85
W2GUR	33	82
W8JM	33	82
W5BK	33	79
GM2UU	33	79
G8VG	33	78
G3BFC	33	77
W6MUF	33	73
W2WC	33	65
W6WUD	33	61
W2NXZ	33	61

PHONE

W6DI	38	140
W4CYU	37	145
W1HKK	37	131
G6LX	37	124
G2AJ	37	121
G3DO	37	116
W8BKP	37	113
G3DO	37	110
G2PL	36	128
W1JCX	36	126
W2BXA	36	122
G6BW	36	119
W1FJN	36	119
W7HTB	36	108
G5YV	36	106
G6WX	36	105
W3DHM	36	96
W6SA	36	80
W2DYR	35	122
W8BF	35	120
W1MCW	35	117
G3FU	35	115
W1NWO	35	112
W6PXH	35	111
GM2UU	35	107
W8REU	35	107
G8QX	35	100
W9HB	35	89
W3JNN	34	113
W9RBI	34	99
W8BIQ	34	97
W6PCK	34	91
W2ZW	33	113
W5ASG	33	106
W2PQJ	33	92
W8QBF	33	80
W2DRH	33	60
XE1AC	32	106
W4INL	32	88
W4HA	32	86
W6CHV	32	84
W2HY	32	81
WØHX	32	82
W9GZK	32	72

a trip to Honolulu with another patient. There were no doctors, nurses, or anyone with medical knowledge on the island. The PAA clipper had departed for Guam an hour and thirty minutes earlier and was recalled to evacuate the patient. In the meantime, *W9EUN/KW6* cranked up his 25-watt 10-meter phone rig and hooked *KG6BS* on Guam, and then gave him the symptoms of the patient. *KG6BS* telephoned the doctor and relayed the advice back to Wake, thus making the patient comfortable until the clipper returned. He was then flown to Guam, where he recovered. As it turned out, the medical advice received over the air probably contributed greatly toward saving his life. Incidentally, there are two stations on Wake, *W9EUN/KW6* and *KW6AC;* both have three-element beams and run 25 watts. *Ex-KS4AE* expects to settle down long enough to get a *KA1* call, which should be about the time you read this.

Last month, W4ESP hooked up with *VQ4EHG* which is the Gatti-Hallicrafter expedition in Kenya Colony. WØLHS was operator at the time, and he said they were temporarily using a vertical half-wave antenna, but were figuring on putting up a rhombic centered on Chicago. WØLHS is from Fargo, North Dakota, and he went on to tell W4ESP that they operate mostly 10-meter phone between 28,450 and 28,500 kc. The following are the call letters they will use in the different countries:

VQ4EHG — Kenya
VQ5HEG — Uganda
VQ3HGE — Tanganyika

They will QSL 100%, and, at least for the time being, here is the QTH: Gatti-Hallicrafter Expedition, c/o Private Bag Nairobi, Kenya Colony, British E. Africa.

VK2NS, Trev Evans sent along a picture of what he calls the "Lazy 9." Along with the photo was what Trev calls a "delayed action QSL" confirming our first QSO in 1934. While on the subject of VKs, *VK2AE* took time out to give me a jingle on the telephone while passing through Los Angeles en route to Toronto. *ON4HC* would like to see more Ws on on the 80-meter band. He says he hopes the Ws will listen for Europeans between 3550 kc and 3600 kc instead of hanging around the edge at 3501 kc. ON4HC wants to thank the W hams who have been kind enough to send food packets over there which helped to make their Christmas merrier.

The correct QTH of *WØMCF/CL* is: Captain H. T. Olson, Navy 3930, Box 10, c/o FPO San Francisco. The January issue carried it as Box 100, hence, the correction.

W4LZM wants us to start a "Carpet Baggers" W.A.Z. The reason is that he has been in the Navy for 14 years, and he can't park himself long enough to do a great deal of DX in one spot. He can't haul a kw around, and usually doesn't have time to erect a good antenna. W1MRQ doesn't have much time, but in only seven hours of operating time, he has 15 zones and 49 countries. This fellow represents a typical new DX station. There must be thousands of the boys getting started in the DX game around the country from whom we do not hear. Most of them, of course, feel there is no use sending in the run of the mill stuff to me, especially since they don't have enough zones to make the Honor Roll. I would like to say we are anxious to receive interesting bits of news from any of the DX men, whether they are old-timers or new-comers. Sometimes we don't print the stuff you send in simply because, in our judgment, it may not be too interesting for the majority of our readers. I have made a habit, in the last few months, of not reporting any of the more common DX, as most of the fellows have indicated that it is not too interesting to them. Where all of you can give a lift, especially the new-comers, is kicking through with interesting incidents about any of the DX gang, whether they are overseas or in the states. Sooner or later, the calls of the DX fraternity get to be pretty well known among those in this gang, and I have always thought an interesting item about one of the DX boys makes better reading than listing a whole mess of the more common DX stations. This ends the first phase of my soap box oratory for this month.

It looks as though we left W1FJN out of the Honor Roll for a month or two, for which we are very sorry. Naturally, we don't do these things intentionally. I think we now have a little better system for tabulating the Honor Roll changes each month, and things like this shouldn't happen again, I hope.

Last month, we said something about W1ZL compiling his list of Zones and Countries while commuting to and from New York on the train. Well, after quite a number of these daily trips, we have his list of Zones and Countries which total 38Z and 128C. W3MLQ warns the whole DX mob to watch out, because he has now changed from 40-meter

(*Continued on page 84*)

1948 DX Marathon

CQ is sponsoring a DX Marathon for the year 1948. The purpose of the DX Marathon is to revive some of the interest that has been lost during the terrific last two years of DX. A simple set of rules governs the DX Marathon:

1. The 1948 DX Marathon began January 1, 1948, and closes December 31, 1948.

2. Competition is on a worldwide and on a zone-to-zone basis. In other words, the high station in each of the 40 zones will be given an award as winner of his zone.

3. Classifications will be the same as in the Honor Roll, i.e., "C.W.—Phone" and "Phone only", thus actually making two winners in each zone.

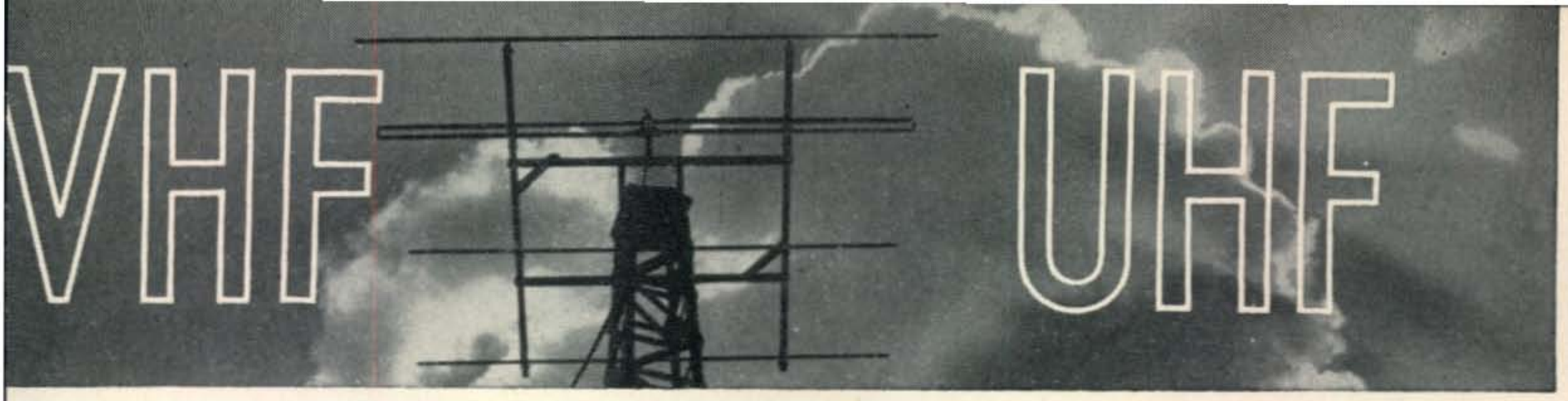
4. In order to receive credit, claims sent to us for zones and/or countries must be postmarked within sixty days from the date of the QSO. This will assure listing the current monthly scores in CQ and eliminate last minute entries.

5. Due to the tremendous amount of detail work, please list all DXMarathon scores on standard reporting forms available from the CQ Editorial Office, 342 Madison Ave., New York 17, N.Y. Enclose a stamped self-addressed No. 10 envelope.

6. Zone and country lists must be submitted in the same manner as though they were for the Honor Roll: the zones listed in numerical order showing the call letters, date, and time; the countries in alphabetical order by country, followed by the call, date, and time.

7. The CQ DX zones of the world, and the official DX country list, will be used for the yardstick.

The cooperation of all DX men in the states to help the word overseas is requested. We think that as the years progress, it will be interesting to see who the winners are from one year to another.



Conducted by VINCE DAWSON, JR., WØZJB*

GENERALLY SPEAKING, conditions on the v-h-f. bands throughout the latter part of January and up to the middle of February were very poor. The North Atlantic MUF was very low, going to a peak of around 35 mc and the U.S. trans-con MUF showed 40 mc as its peak. The path to the south and Pacific areas showed some promise, after the middle of February, and XE1KE again started things off with a bang.

Conditions for XE1KE in Mexico City had been very quiet since October for working into South America. On Feb. 18 at 1950 CST, with his beam NW, XE1KE heard W7K?D S-3, calling CQ on phone. At 1958, with the beam still NW, LU9MA was heard S-3, followed by LU1AM at 2005, S-6. Turning his beam SE, XE1KE then worked LU9MA at 2025 CST with S-6 signals. LU9MA stayed in until 2050, calling OA4AE. The next day, Feb. 19, LU9MA was again heard from 2007–2025 CST, talking to other LUs. Feb. 21 LU9MA was again heard for two hours, from 1600–1800 CST, working other LUs, his signal was very weak with QSB, barely coming out of the noise level. XE1KE has received word that KL7CM has heard him, but no dates or time given. Activity in the Mexican Capitol has increased with XE1A, XE1FE, XE1GE, XE1QE and XE1KE all quite active each evening.

Of particular interest, we note the absence of aurora openings in comparison to a year ago, when some very nice ones were reported. Whether the lack of aurora openings is due to the peak period we are in remains to be seen. If they pick up next year the battle of sunspot minimum and maximum, versus ionosphere storms will be over.

QRR 220-235 mc Band

Yes, fellows, we have an emergency existing regarding the 220–235 mc band, whichever the F.C.C. rules is ours. Our being able to keep amateurs bands means using them, yet activity is lacking on what could be a very interesting spectrum to experiment on. The F.C.C. is now contemplating the removal of television channel 1, covering 44–50 mc, because of sky-wave and bending interference. All the spectrum up to over 400 mc is now alloted and in use, except on 220–235 mc. We badly need activity to insure it remaining ours! Let's take a hint and get things going on this band. 6J6s and 6J4s work very nicely there; try 'em.

Openings

Several Es openings on 50 mc have occurred Let's take a look at what happened.

Jan. 23: Harold Tucker, W8QYD, found the band open from 1927–2115 EST, when he worked the following: VE1QY, VE2KH, VE3BDY, W1AF, LJ and W1POD; not a strong opening as QSB was bad. W9ALU had good luck and hooked W1CGY in Vermont for state 33; others worked were: W1AF, W1QUR, HIL, CLS and W2RYT, from 1928–2010 CST, all with good conditions.

Feb. 18: W6IWS worked: W5ESZ, W5VY/5, W7MWQ, MVB, QLZ from 1849–1950 PST with very good condx. W7MWQ in Phoenix worked: W6IWS, BPT, EUL. W7MVB also in Phoenix made it with: W5FSC, W6EUL, BPT, JYR, IWS, CAN. W7QLZ worked: W5AJD, W6IWS, BPT, EUL, JYR, and mentioned an MUF peak at 2015 MST of 50.9 mc, as he was unable to hear W6CCJ on 51.3 mc.

Feb. 19: W7MVB raised W5FSC and W5JLY, while W7QLZ made it with W5JLY, W5LIV and W5FSC from 1900–1945 MST with fair condx.

Foreign Notes

From G2XC's column in *Short Wave Magazine* we find further information on November's DX session. OK1AW reports signals from W1–5–8 on

**Send all contributions to Vince Dawson, Box 837, Gashland, Mo.*

W4IUJ receiving Milwaukee RC 50-mc trophy at Lake Worth Hamfest. Left to right: W4DRZ, W4FNR, W4IUJ, W4FLH, W4KKU.

50-MC DX HONOR ROLL

Calls	States	Districts	Others
W6UXN	46	10	VE1, 2, 3, 6, 7-KH6
W4GJO	45	10	VE1, 2, 3-OA4
WØZJB	45	10	VE2, 3, 4, 7-G5
WØUSI	45	10	VE2, 3, 7
W6WNN	45	10	VE1, 7
W9DWU	45	10	
W9ZHL	45	10	VE1, 2, 3, 4, 7-XE1-KL-G5-HB8-G6, 5-KL7
W1CLS	44	10	VE1, 3, 7-G5, 6-F8-PAØ
W7BQX	44	10	VE1,3,4,7
W7ERA	44	10	VE1, 7
W7FFE	44	10	VE1, 7
WØDZM	43	10	VE1,2,3,7
WØQIN	43	10	VE1,2,3,7
W9PK	43	10	VE1, 2, 3, 4-XE1
W9ZHB	42	10	VE3, 4, 7-G5-HB8-KL7
WØBJV	42	10	VE2, 3, 7
W3CIR/1	41	10	VE1
WØINI	41	10	VE2, 3, 4
W5VY	40	10	VE3, 4, 7-KH6-LU9-XE1-OA4-PAØ-G2, 5, 6,-F8-HB8, 9
W8ZVY	40	10	VE1, 2, 3-OA4 - LU9 -KL7- PAØ, G2, 5, 6
W4QN	40	10	VE2, 3 - OA4
W1LLL	40	10	VE1-G5 - G6 - PAØ
W8NSS	40	10	VE1,4-VP7
WØSV	40	10	VE7
W4GIY	40	10	VE1
W4EQM	39		VE1, 2, 3, 7-XE1-KL7
WØYSJ	39	10	VE2, 3, 7
W6AVV	39	10	VE1,7-KH6
W7HEA	39	10	VE1-7
W8QYD	39	10	VE1,2,3,4-OA4-G5
W5JLY	38	10	VE3, 7-XE7 -OA4 -G5, 6 - PAØ HB8
W4EID	38		VE1, 2, 3, 7-OA4
W2AMJ	38	10	VE1, 3, 7-G2, 4, 5, 6-F8 - PAØ - HB8
W5AJG	38	10	VE2,3-KL7-G5, 6-HB8 -PAØ
W5FRD	38	10	VE3, 7-XE1 -PAØ
W5ML	38	10	VE3-XE1
W8ZVY	38	10	KL7-G5
W6OVK	37	10	VE1, 2, 3, 7-KH6
W2RLV	37	10	VE1, 3, 7-KL7-G2, 5, 6-PAØ
W2IDZ	37	10	VE1, 7-G5-G6-PAØ - F8
W6OYK	37	10	VE1,2,3,7-KH6
W7DYD	37	10	VE1, 7
W9UNS	37	9	
W5VV	36	10	VE7-XE1
W7FDJ	36	10	VE1, 7
W5FSC	35	9	VE1, 3, 7-XE1 - OA - KL7
W1GJZ	35	10	G5, 6-HB8 -PAØ
W5HF	35	10	VE1,3,4,7
W1JLK	35	10	VE7-G5
W2BYM	34	10	VE1-VP7
WØDKS	34	10	VE3
WØJHS	34	10	VE1-2
W7GPA	34	10	
W4WMI/4	33	10	VE1, 2, 3-VP7
W1HDQ	33	10	VE1 - G5 - G6-PAØ
W6BPT	33	10	VE1, 2, 3, 7-KH6
W4DRZ	33	10	VE1, 2, 3,
W6PUZ	33	10	VE3-7
W7KAD	33	10	VE7
W3MKL	33	10	VE1, 7-G5
W9ALU	33	10	VE1, 2, 3, 4-G5-KL7
W1CLH	32	10	VE7 - G5 - G6
W3RUE	32	10	VE1-G2, 5, 6
W6FPV	31	10	VE1, 2, 3-KH6
W4FBH	31	10	VE1, 2, 3-XE1
W5LCZ	31	10	VE3-XE1
W3OMY	31	10	VE1-VP7
W5WX	31	10	VE4-XE1
W4HVV	30	10	VE1, 2, 3
W9UIA	30	10	VE1, 2, 3
W5ELL	29		VE7-XE1
VE1QY	28		G5, 6-VE1, 3, 7
W4EQR	28	10	
W6ANN	28	9	VE3-7
W1CGY	28	8	VE1 -G 5-G6-PAØ
W4FQL	28	9	VE1
W1ATP	28		VE1, 7-G5
W9FKI	28		VE1, 2, 3 - KL7
W7ACD	27	8	
W5LBG	26	8	VE7-XE1
WØDNW	26	10	
WØYKX	26	10	VE2, 3
W7BOC	26	9	VE1
W6NAW	25	9	VE7
W5ESZ	25	8	VE7
W4FNR	25	8	VE3-OA4
VE1QZ	24	8	VE1, 2, 3, 7-G2, 3, 5, 6-F8 - HB8-PAØ
W7JPA	24	8	VE7
W5LIU	24	8	VE3-XE7
G5BY	23	8	W1, 2, 3, 4, 5, 8, 9, Ø-VE1, 2, 3-MD5 - SU1-ZS1
W8MVG	23	9	G5, 6-PAØ -F8
W9AB	23	9	VE1,2,3,4
W7CTY	22	9	VE7
W4JML	20	9	VE2-3-G5
W7ACS/KH6	3	3	W5, 6, 7-J9 - VK5 - KH6

Nov. 22 and W1–2–5–8 on Nov. 23. Transmissions from W1–2–5–8–9 were heard in Hamburg, Germany, by ex-D3KNN on Nov. 22–23, while W2BQK was heard on phone very nicely, on Nov. 27. Dec. 20 VK2NO and VK2OC started their Es session by working cross-band with ZL4BN. The following day all ZL districts were worked on 50 mc, and all VK districts except VK6.

VE1QZ, Oscar Landoz, says that the let-down from November has been terrific, for the last European opening was on Dec. 1, 1947, and the last trans-con to W7 was Jan. 2, 1948. Oscar says that he, VE1DN, VE1JK, and VE1SF are the only ones active on 6 meters, and VE1SF on 144 mc.

Who are these stalwart men of the v-h-f region, who day after day scan the megacycles for signs of signals? Perhaps part of the answer can be found in a resume of their personal lives.

Little did the LUs know that on Mar. 8, 1904, there was born a man who was to come into their midst by putting a signal there on the 6-meter band. For on that date, B. J. Kroger, XE1KE, ex-W3PH, was born, and the story he has made working into South America and the States on 6 meters is well known by v-h-f men everywhere. B. J. was reared in Washington, D. C., and started his career in radio with Westinghouse Research Labs in 1926. 1927 saw him move to Fox Movietone in New York, off to California in 1928 with Fox Studios, 9 months in Europe, thence back to California. In 1932 the move to Mexico was made, which has been unin-

(Continued on page 94)

(Number seven of a series)

S/N

This month, we'd like to discuss noise and how too much of it can make an amateur's life very miserable indeed; we don't mean the domestic variety of bedlam, the electronic breed being quite sufficient for us! If your station is situated near high tension lines, street car tracks and busy intersections, you undoubtedly know that a great many of the random sounds coming out of the receiver stem from these noise generators. And on certain dreary days, especially during the summer months, you can count on additional QRN from atmospheric disturbances. All these outside noise sources can usually be reduced by careful antenna design, filtering and so forth so that their overall effects are small. If it were possible to silence them completely, a theoretical case of course, the noise elimination problem then becomes involved only with noises originating in the receiver itself.

Poor quality resistors, as well as other dubious components, contribute to excessive receiver noise, especially when located in the "front-end." And of course, poorly designed circuits contribute their share. Then, some noises are inevitable such as those contributed by thermal agitation, shot, flicker and ionization effects, although their magnitudes may be reduced. Of these, the most important is noise generated by thermal agitation within input circuit conductors. When current flows, the general orderly drift of electrons in one direction may have superimposed upon itself a random electron motion which results in a random fluctuation of voltage being developed across the conductor itself. This fluctuation voltage is called the thermal agitation noise voltage and is, unfortunately, distributed over the entire frequency spectrum. The noise voltage increases with bandwidth (as you've probably observed when operating a receiver equipped with a good crystal filter), and for a fixed bandwidth, reduction in this voltage is accomplished either by decreasing the resistive component of the impedance producing the noise voltage or by lowering room temperature. Tuned circuit resistance is held to a minimum in good receiver design, since the overall result is much more satisfactory than reducing the shack temperature, which is usually low enough anyway! The most important point is that you will be unable to read a signal too weak to overcome noise generated by the first tuned circuit and that is why the number of microvolts required to produce a usable signal/noise ratio is information you should look for when shopping for a receiver.

The three other noise sources mentioned above are generated in vacuum tubes, being worse as can be expected in poorly assembled varieties. Shot effect is caused by irregularities in the rate of arrival of electrons at the plate, despite constant grid-cathode voltage, and is minimized by maintaining adequate space charge through sufficient cathode emission. Flicker, caused by uneven emission over the entire cathode surface, frequently masks the shot effect, while the ionization effect created by positive ions upsetting the space charge equilibrium adds still more noise. When all noises combined are less than a microvolt, with a good antenna and a reasonably quiet QTH, you'll hear just about everything on!

Bill Bartell, W1PIJ

The YL's Frequency

Conducted by LOUISA DRESSER, W2OOH*

DX VISITING IN PERSON at the *CQ* offices recently included Joy Jones, ZS6MW, and her OM, ZS6H. Joy, whose home is Pretoria, South Africa, is one of the newest members of YLRL. She and her OM are on a combination business and vacation trip, though with two good hams in the family equally major objectives will be to visit as many W hams as possible and pick up some radio gear.

The ZSs really get around. Latest from Diana, ZS6GH, who was here only a few weeks earlier, was a letter written at Gragheda, Irish Free State, in which she said how much she had enjoyed her visit here in the U. S., and added: "You Americans take a lot of beating as far as generosity, hospitality and entertainment is concerned. Believe me, I am proud to be a member of YLRL.

"While in Bradford (England) I contacted some of the members of R.S.G.B. and had a few QSOs on the 160-meter band. The power limit is 10 watts.

"I came over to Eire on the 12th January, and am spending a little time with a girl I met on the S. S. AMERICA. There's one ham here, EI9P, who operates c.w. only, 20 and 80 meters. I was up at his shack last night and pounded the key. I was a little shaky for it was my first try at c.w. since I left South Africa 18 months ago. Hi!"

We have just had an interesting visit with Rita Wittman, W2QJC, at Press Wireless in the famed *Times* building on Times Square. Formerly a Powers' model, for the past five years Rita has been at PW, for the first six months as controlroom engineer and since that time as a radio operator. It keeps Rita on her toes monitoring circuits from all over the world and copying press in foreign languages as well as English. Most of the newscasts are automatically recorded, and Rita transcribes the copy from the dots and dashes of the inked "slip," but if there is a break in the copy or receiving conditions are not "good enough" she has to break in and request repeats or transcribe all the copy aurally. DX is easy for her, with London, Moscow, or Buenos Aires at fingertip control!

Rita, who speaks with a soft Southern drawl acquired in her home town of Chattanooga, Tenn., tells us that as far as she has been able to determine she is one of only four girls in the U.S.A. holding similar commercial radio operator positions. Two others, Hilda Martin and Eunice Jordan, are also at Press Wireless, and Sheva Varsel is with Mackay Radio. All four girls received their radio training in 1940–41 under the N.Y.C. AWVS program, Rita being in the first class taught by Lenore, W6NAZ. All have their amateur operator licenses, and Eunice also has applied for her station call.

Apparently the comments from W6WSV published in January *CQ* stirred up some repercussions. This phone vs. c.w. controversy probably never will be won by either side, but we feel the reaction of Lenore, W6NAZ, is sufficient to end all discussion on the subject—in this column at least! Lenore points out that her comments are personal, not official YLRL, and says:

"As one of the many YLs who have used both c.w. and phone extensively on several bands, I find it impossible to compare the two modes of operation —c.w. and phone are as different as night and day, almost like two different hobbies! A good operator is just as pleasantly conspicuous on phone as on c.w.—and unfortunately the lids can bore you with a key or mike with equal ease, but they are few, thanks be. (In fact, an occasional lid should serve to remind us to check our own operating habits.) Phone or c.w.? I vote for both!!"

*Assistant Editor, CQ. Send all contributions c/o CQ, 342 Madison Ave., New York 17, N.Y.

Eunice L. Randall, W1MMP, YL of the Month

Club News

The YL Radio Club of Los Angeles had one of its biggest turnouts for the February meeting, with fourteen present. The club met at the home of Maxine, W6UHA, and, the date being the 14th, the occasion was made a St. Valentine's Day celebration, complete with Valentine-decorated cake. Unexpected visitor was Beryle, W2RNJ, of Madison, N. Y., who is vacationing in California.

The San Diego YLRL is sorry to lose its first president, Ellen, W6YYM. At present visiting her folks in New York, Ellen will soon fly to Hawaii to join her OM, W6YYN, who is with the CAA. Eleanor, W6AWW, tells us that their new president is Jean, W6YZD. The club has been invited to join the Council of San Diego County Clubs and Jean, W6YZD, and Neva, W6YXI, will attend meetings.

(*Continued on page 62*)

EVERYTHING YOU WANT..... in a high quality low cost receiver

Model hallicrafters NEW S-53

- Coverage: 540 kc to 54.5 Mc
- Five bands
- Accurately calibrated slide rule dials
- Full electrical bandspread
- Series noise limiter
- Universal antenna input
- Built-in PM speaker
- Beat oscillator
- 2.5 watt audio output

Hallicrafters Model S-53 takes an important position in the Hallicrafters line of high quality communications receivers. Completely modern. Superbly engineered for top flight performance at remarkably low price. All the Hallicrafters built-in quality features amateurs expect and demand in a good receiver. Extended frequency range from 540 kc to 54.5 Mc in five bands. Uses two Mc IF which positively eliminates all amateur station images or repeat points within the ham bands. The strikingly designed, edge lighted dial is precisely calibrated. A separate bandspread control provides full electrical bandspread on all frequency bands. Latest series type noise limiter circuit; voltage stabilized oscillator; iron core IF's; built-in PM dynamic speaker. Rich satin-black steel cabinet with satin chrome trim. Complete with seven tubes and rectifier. 105-125 volts, 50-60 cycles AC **$79.50**

Overall tuning range: 540 kc to 54.5 Mc. Band 1: 540-1630 Kc; Band 2: 2.5-6.3 Mc; Band 3: 6.3-1.6 Mc; Band 4: 14-31 Mc; Band 5: 48-54.5 Mc.

Controls: main tuning, bandspread, bandswitch, RF gain, audio volume, tone control, noise limiter, standby-receive, phone-code switch, speaker-headphone switch and phone jack on rear panel. Input jack for record player pickup connection.

New superhet circuit uses: 1—6C4 oscillator; 1—6BA6 mixer; 2—6BA6 IF's; 6H6 detector-AVC-noise limiter; 6SC7 BFO-1st audio; 6K6GT audio output and SY3 rectifier.

Size: 12⅞" x 6⅞" x 7⅞".

LISTEN FOR THE GATTI HALLICRAFTERS EXPEDITION

Hallicrafters mobile, radio-equipped expedition now operating via short wave from the Mountains of the Moon, Africa. Listen for these call letters:

VQ5-GHE VQ3-HGE VQ4-EHG VQ5-HEG

Visit your distributor for maps, itinerary, schedules, other details.

hallicrafters
RADIO
THE HALLICRAFTERS CO.
4401 W. Fifth Ave., Chicago 24, Illinois
MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT

PARTS AND PRODUCTS REVIEW

Preferred Types Tube List

The RCA Tube Department has just brought out a new issue of the RCA Preferred Types List, revised to keep abreast of advances in the electronic field.

The RCA Preferred Types List covers receiving tubes, cathode-ray and camera tubes, gas tubes, phototubes, and power amplifiers and oscillators.

A copy of the list can be obtained without charge from Commercial Engineering, RCA Tube Department, Harrison, N. J.

Non-corrosive Flux

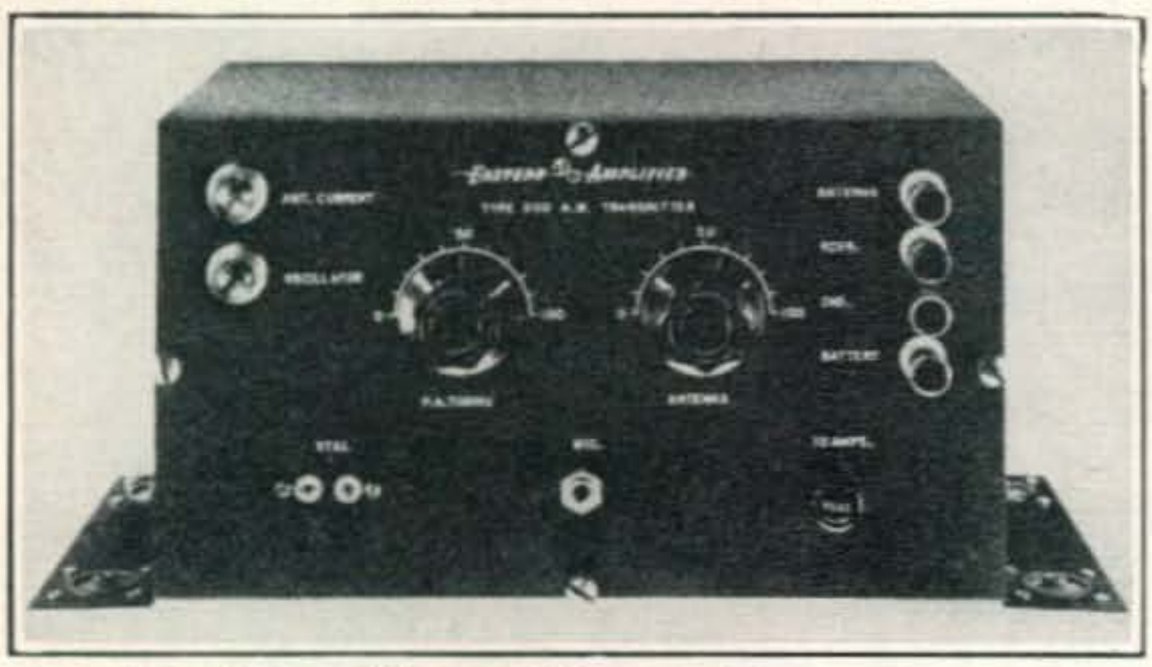
Decimeter, Inc., of Denver, Colorado, manufacturers of ultra-high frequency radio equipment and instruments, has established a chemical division within their organization.

Products will include call letter, dial plate and title decals in several types and sizes. These are a water decal that will adhere to all panel finishes.

Another item included in Decimeter's chemical division is an entirely new, liquid soldering flux. This is strictly a non-corrosive flux, and was developed in the Decimeter laboratories particularly for high frequency soldering. This new flux has several advantages over present types. It is used with coreless solder, thereby eliminating resin stains, and the solder follows this flux instantly, cleanly and completely. This flux will be marketed under the trade name of "Silver-Q."

10-Watt AM Transmitter for Mobile Use

Designed for portable and mobile use, the model 600 Eastern Mobile Transmitter is a complete self-powered 27–30 mc transmitter. Compact in size, it measures only 10½ x 6 x 6¼" deep including the built-in power supply. Output is 10 watts and within the specified band, crystals can be changed without



retuning the oscillator. No stand-by current, reducing battery drain and push-to-talk operation and automatic antenna changeover from receiver to transmitter are features. The output will load any type antenna from 10 ohms to several thousand ohms. Universal shock mount brackets are supplied. Model 600 uses 4 tubes, 1–2E30 crystal oscillator and doubler, 1–2E30 power amplifier, 1–2E30 plate modulator and an 0Z4 rectifier.

Transmitting and Receiving Tubes

A new 400-watt Eimac tetrode, type 4–400A, is announced by Eitel-McCullough, Inc., 189 San Mateo Ave., San Bruno, California.

This new tetrode is ruggedly designed, physically small and of compact structure. Short low-inductance leads, processed non-emitting grids, thoriated tungsten filament and plate of new Eimac material,

Pyrovac, are design features contributing to exceptionally long tube life and economy of operation.

The 4–400A is radiation cooled and is suggested for use only in the special Eimac socket and air duct that provides maximum cooling from a small amount of air. Two 4–400A tetrodes conservatively operated will provide a full kw on the 144-mc band.

The RCA OB2, like the OA2, is a miniature cold-cathode, glow-discharge tube. The OB2 regulates at approximately 108 volts over a current range of 5 to 30 ma, whereas the OA2 regulates at approximately 150 volts. These two types permit equipment designers to provide regulated B and C voltages in compact equipment where space heretofore precluded use of the larger voltage regulator tubes.

The RCA-types 6AV6 and 12AV6 are multi-unit miniature tubes, each containing two diodes and a high-mu triode. The diodes are for use in detector and a-v-c circuits, while the triode is for use as a resistance-coupled audio amplifier stage.

The triode features a value of transconductance almost 50 per cent higher than that for previous similar types having the same amplification factor of 100. Consequently, the triode is capable of providing not only exceptionally high voltage gain but also a large voltage to the input of the power output stage.

The 6AV6 and 12AV6 are identical except for their heater rating. The 6AV6 requires 6.3 volts, 0.3 ampere; the 12AV6, 12.6 volts, 0.15 ampere.

It's Front-page News!

MICAMOLD XTR-1

45 WATT - 3 BAND CW TRANSMITTER KIT

Only $34. less tubes, crystal and key

Micamold fires the opening shot in the war on high prices with a low priced, high quality transmitter kit *priced within easy reach of every amateur.* Very simple to assemble. Complete from power supply to antenna matching network. Just plug in the tubes, crystal and key and you're on the air.

Operates on
80, 40 and 20 meters

Quality Engineered and Equipped Throughout

BAND SWITCHING . . . No coils to plug in. A flip of the switch puts you on 3.5, 7 or 14 MC band using suitable crystal.

SUREFIRE CIRCUIT . . . Crystal ECO (6AG7) driving final amplifier. No neutralization is required. Crystal current is less than one milliampere. Band switch controls both a tapped broad tuned oscillator plate coil and the final output circuit. Pi-network matches any antenna. Puts out a clean cut signal, no chirps.

ABSOLUTE SAFETY . . . No exposed live parts. When used with insulated lead-in wire it is impossible to get a shock during adjustment or operation.

SOUNDLY ENGINEERED . . . Designed to last and fully guaranteed! Every Micamold XTR-1 kit contains Grade A components including Micamold Capacitors, and is sold under the provisions of the standard warranty of the Radio Manufacturers Association. Simple, clear instructions for assembly, wiring and operation.

If your dealer does not have a kit on hand write to us for the name of the nearest dealer or send your order direct to Micamold with your remittance. Your kit will be shipped promptly.

Micamold

MICAMOLD RADIO CORPORATION

Manufacturers of High Quality Electrolytic, Paper, Mica Capacitors and Resistors

1087 FLUSHING AVENUE, BROOKLYN 6, N. Y.

THE YL'S FREQUENCY

(*from page 58*)

San Diego's loss was the gain of the N.Y.C. YLRL, temporarily at least, for we were glad to welcome Ellen, W6YYM, at our February meeting. Ellen was formerly a member of the N.Y.C. club, and twenty-one of the girls turned out to welcome her back. The meeting was held in the AWVS building, and was devoted almost entirely to a fine-tooth combing of the proposed new constitution. We then adjourned to a near-by Childs where, over pancakes and coffee, we had a good rag-chew about our rigs, DX, BCI and TVI, and listened enviously while Ellen told us how much she looked forward to having a KH6 call and all the QSOs she wanted without being "just another W."

Personal Mention

Congratulations to Naomi, W6YZU, who is the first YL to W.A.Z. Her score is 40 zones and 129 countries, to date, and she will receive W.A.Z. certificate No. 17. Her OM, W6LEE, made it for certificate No. 9.

Jerry, W2PBI, has been thrilled over keeping schedules on 10 phone with the Gatti-Hallicrafter expedition, VQ4EHG, which so far have been very successful. Running only 75 watts, Jerry really gets out on 10, having worked 64 new countries. She gives much of the credit to the 4-element beam her OM constructed for her.

Hope, W2RTZ, has made the Brass Pounders' League three months in succession.

Barbara, W2TWJ, is proud of her Class A ticket, just received.

Amelia, W2OLB, has left Seattle and expects to spend several months in San Francisco, her mailing QTH to be c/o General Delivery in that city. Amelia found the W7s most hospitable and is looking forward to meeting many of the W6 YLs.

Lillian, W2PMA, has been seriously ill during the past several weeks. We all wish you a speedy recovery, Lil.

Bea, W7HHH, passes on the news from Verna, KL7AX, who writes from Ugashik Lake, Alaska, on Jan. 14th: "Received our mail for the first time this winter. All our radio magazines are several months old when we get them, but we enjoy them just the same. We are on 28 mc every afternoon. Haven't had any unusual contacts, but all are rather amazed when I tell them we are in a trapping cabin. Have a little 25 watter going, and a rhombic 68 feet on the leg, and it surely does work for us."

Lou, W6VWR, is one of the latest gals to get on the air after a long lapse due to sickness, moving, etc. She is on 40 and is getting a thrill out of her first postwar QSOs.

Carol, W6WSV, will also be on 40 in time for the YLRL contest.

Thelma, W9JYO, who has been inactive since the war, expects to be on soon from Memphis, Ind., where she says receiving conditions are fine and there's lots of space for antennas. Thelma claims to be a real OW for she has held her ticket for fifteen years. Formerly of Louisville, Ky., she was the first licensed YL in the area at that time.

Some newly issued calls we also hope to be hearing on the air soon are: W3NXU, Elizabeth; W3NYR, Dorothy; W4MYG, Gladys; WØEZY, Mildred; WØFAG, Doris; W4MZE, Dorothy; W6BIS, Ida; W1QWL, June; W6BLR, Marie; W7LUU, Carol;

MERIT

Since 1924

FINE RADIO PARTS

PRICE ECONOMY with MERIT QUALITY!

MERIT Model "D"

In transformers the greatest economy is found in the highest quality. It is *quality* throughout that insures dependable performance, freedom from service. But MERIT Quality can also be had at a *first* saving.

CHECK THESE VALUES WITH YOUR LOCAL JOBBER

MERIT PLATE TRANSFORMERS

Type No.	List Price	Sec. Rms. Volts	Sec. DC Volts	DC Sec. M.A.
P-3157	**$9.25**	(660–660) *	(500)	250
		(550–550)	(400)	
P-3159	**10.00**	(900–900)	(750)	225
		(800–800)	(600)	

* Has 40 volt bias tap

DIMENSIONS

	H.	W.	D.	Mtg.
P-3157	4 5/8	3 13/16	4 3/8	D
P-3159	4 5/8	3 13/16	5 1/8	D

MERIT COIL & TRANSFORMER CORP.

TELEPHONE

4427 North Clark St. Long Beach 6311 **CHICAGO 40 ILL.**

W9CNW, Sue; WØFGF, Naomi; W4NBG, Thelma; W1QXY, Anna; W5NZS, Eloise; W5OAC, Florine; W6BSZ, Elizabeth; W7LXN, Virginia; W3OCH, Adele (or with her OM's call, W3NYN).

YL of the Month

Several months ago in this column we promised to tell you more about Eunice L. Randall, W1MPP. This old-timer YL has a background in radio dating back to World War I. She headed for art as a career, but when her first term at Normal Art School ended in 1917 she spent her vacation by working for Amrad (the American Radio and Research Corp.) which was then operating 1XE as an experimental station at Medford Hillside near Boston.

Eunice found radio more exciting than art. Her drafting table was in the shadow of a 300-ft. tower which, on at least one occasion, brought a bolt of lightning right into her office. Her early work included design drawings for the then famous Amrad quenched spark gaps, basketball variometers, wavemeters, and lightning switches.

As receiving equipment developed, 1XE became more active and Eunice became undoubtedly the first YL radio narrator. According to her: "It took twenty separate operations to get the transmitter of 1XE on the air. Early programs included daily broadcasts of police blotter scuttlebut on both voice and c.w., after which we'd keep the frequency open for amateurs to call in reports."

Later the station assumed a sense of dignity, and in 1922 became WGI (which merely authorized it to share 360 meters with twenty-odd other stations in a thousand-mile radius.) Eunice not only turned platters, but conducted a bedtime-story half hour.

Finally WGI got mixed up in consolidations, and local operations were conducted by remote control. Eunice picked up her instruments, and got a job with the local Ward Leonard office. Then in 1929 she joined an electric utility company, which later became the New England Electric System. There she is now an oracle on any questions concerning inter- and intra-company circuits. She is also a specialist on maps—she does them for all the system.

From the amateur standpoint, Eunice's interest dates to 1921 when she operated 1CDP from her farm home near New Bedford. W1ZE, then 1HAA, collaborated in the undertaking. Her transmitter was remote controlled half a mile away, and made a real c.w. splash until lightning came along and made a bigger one. Then followed a gap to 1938, when she opened up in Watertown, Mass., with the call W1MPP, which she is known to dub "Madam Pickle Puss" ('tisn't so—we know her!).

During the war Eunice was very active in WERS, and re-emerged postwar on 2, 80 and 75. More recently she has fired up a TBS-50 especially for 6 and 10 meters. She is claimed to be the sole YL member of the Pajama Club which purports to meet daily at 0645 on 3990 kc. All too often Eunice is on her way to work before other net members have stirred.

In her "spare" time Eunice attends hamfests in the 1st and 2nd districts, IRE meetings (a member since 1939), and sparks the Eastern Massachusetts Amateur Radio Assn., which turns out an average of 125 attendance at its twice-monthly meetings. For five years she was secretary, is now president, and in 1946–1947 was program director for the record-breaking Boston Hamfests.

Anything else? Yes, she keeps her fist in trim by reporting in once weekly to the New England Electric System 40-station c-w net (3655 kc), paints, collects buttons and coins, and does needlepoint—all without the aid of benzedrine!

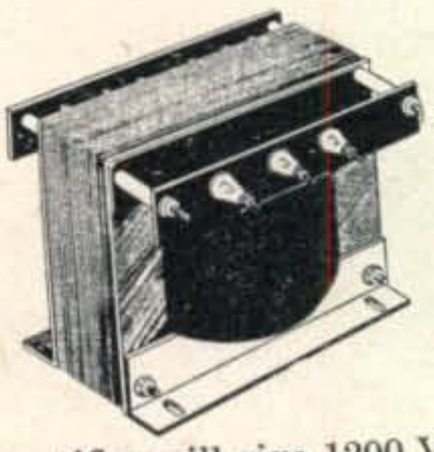
HARRISON HAS IT! HARRISON HAS IT!

All Regular Lines? — You bet!
Receivers? — **Every** Set!
Bargain Prices? — Lowest yet!
Fast Service? — *JET!*

If you can't visit either of my well-stocked stores, phone or mail your in orders for reallysuperior SERVICE. All standard lines at lowest prices.

73, *Bil Harrison,* **W2AVA**

PLATE TRANSFORMER BUY



A super Surplus Value in a rugged xformer to power your entire rig! 1170 Volt CT secondary will deliver up to 500 Volts DC at 750 Ma with choke input filter, or 600 Volts DC at 600 Ma with condenser input. (Use branch or duplex rectifiers and filters for added flexibility and stability). With half-wave or bridge rectifier will give 1200 Volts, 300 Ma. TWO, with secondary windings in series, will economically make available 1200 Volts at 600 Ma!

Primary is 115 or 230 Volt, 60 cycle, with taps to reduce output 10% and 20%.

FB regulation!—plenty of good grade iron and copper. Compact!—6¾" wide x 6" high x 6½" deep (overall, including ceramic HV feedthru insulators). Husky!—22¾ lbs. Dependable!—made to Gov't spec by reputable manufacturer. Sensationally Priced!—lots of FOUR (Tell your friends or club!) in one original woodcase at **$4.99**
Less than four—**$5.95** plus repacking charge of **80c** each.

Don't forget to include in your order the rest of the items you need for that new power supply—filament xformers, rectifiers, sockets, bleeders cond switches, chassis, etc!—
Harrison has it

Precision Resistors

Finest grade 1% accurate Wire Wound. WW4, WW5, etc. 750, 1K, 5K, 10K, 20K, 100K, 400K, 600K, 750K, 800K **FOUR for $1.98**
1. Meg—**Three for $2.09**

ARC-5

BC-454B Receiver. 3 to 6 MC. Brand new, complete with tubes..... **$4.95**

3C24/24G Tubes SIX for.....$2.36

FILTER CHOKE BARGAIN

Smooth away your ripple with this 15 Henry, 175 Ma reactor. 200 ohm resistance. Fully shielded. 3½" x 3½" x 4¾" high. Weighs 5 lbs. You'll recognize the good name! **$1.94**

Two or more at **$1.69** each.

LONG ISLAND HAMS

Our JAMAICA BRANCH is mighty convenient to save time—and money.
See W2KYV **Hillside Ave. at 172 Street**

New VHF Receiver

A "natural" for hams, labs, utilities, fire buffs, etc.! Successor to the 1-10, National's new HFS is a 27 to 250 Mc super-het with 10.7 Mc IF and super-regen second detector. A good AM—FM—CW 7 tube receiver with built-in speaker and phone jack. May also be used as a converter for dual-conversion, image free reception. Complete with coils, less power supply..... **$125**

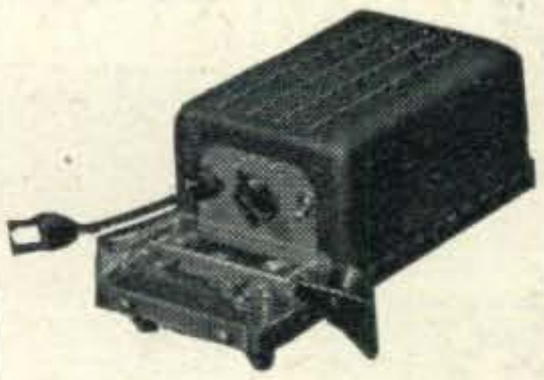
AC pack—**$22.43.** 6V DC Vibrapack—**$34.16**

SSSC

National's new F-22 Sideband Filter. See page 44, March QST. First delivery scheduled for March. Includes balanced input and output transformer. Price will be around **$50 — $60.** Mounted 550 Kc Crystal **$5.95.** 465 Kc Double slug tuned IF's **$2.40.** New developments? We'll have the very newest things as they come out!

NIGHT SHOPPING—
For your convenience, and ease of parking New York, Wednesdays Jamaica Branch, Fridays **UNTIL 9**
(Bring the YF and kiddies!)

"MON-KEY"



Why monkey around with an old fashioned key when you can gorilla to town with this new electronic MONitor-KEYer and be a chimpion operator! Have at ape-perfect fist without simian to exert yourself. Your dashes won't swing by their tails!

No fooling! It really is a darn good key. We're selling a barrel-full of 'em and their users are enthusiastic about the ease of keying. Get yours now and enjoy a new pleasure. Considering the value, the cost is really peanuts..... **$29.95**

In New York—ONLY Harrison Has It

Get ready for summer fun on 2 METERS!

Abbott BM-2 Five element all alum. beam. List **$23.50.** Special!—**$8.82.** Abbott TR-4B. Latest type. Transmitter—Receiver. Good for mobile. Regular net **$52.** A buy—**$29.95.** E-L 2606 Vibrator Pack. 6V DC to 300 Volts 100 Ma, filtered—**$14.97.**

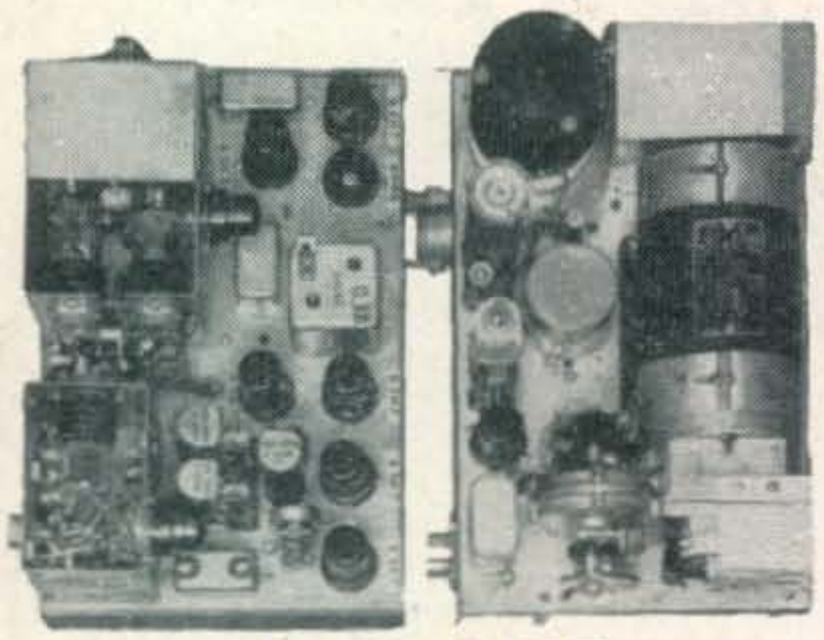
HAM HEADQUARTERS *Since... 1925!*

HARRISON RADIO CORPORATION

11 WEST BROADWAY • NEW YORK CITY 7
PHONE—BArclay 7-9854 • EXPORT DEPT.—CABLE—"HARRISORAD"
[JAMAICA BRANCH—172-31 Hillside Ave.—REpublic 9-4102]

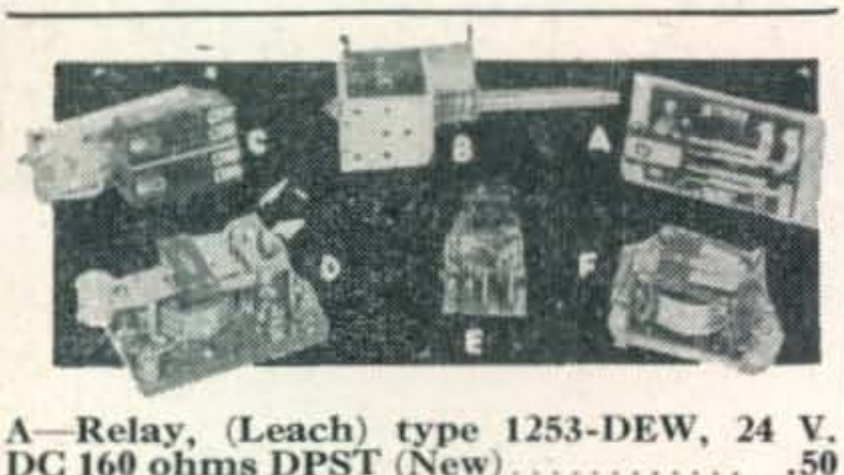
ESSE Specials!

Do not fail to closely examine this list of bargains. We believe that every item listed below is a sensational value that soon can never be repeated. All equipment advertised herein is unconditionally guaranteed to the customer's satisfaction to this extent: Return any item advertised within five days after delivery for full refund except transportation charges (both ways).



BC-966-A IFF

Approximately 2 meter frequency operation. 14 tubes, 350 V. DC dynamotor 12 V. DC input. Contains voltage regulators and many other fine parts. Worth more for parts than price asked..... **$4.75**

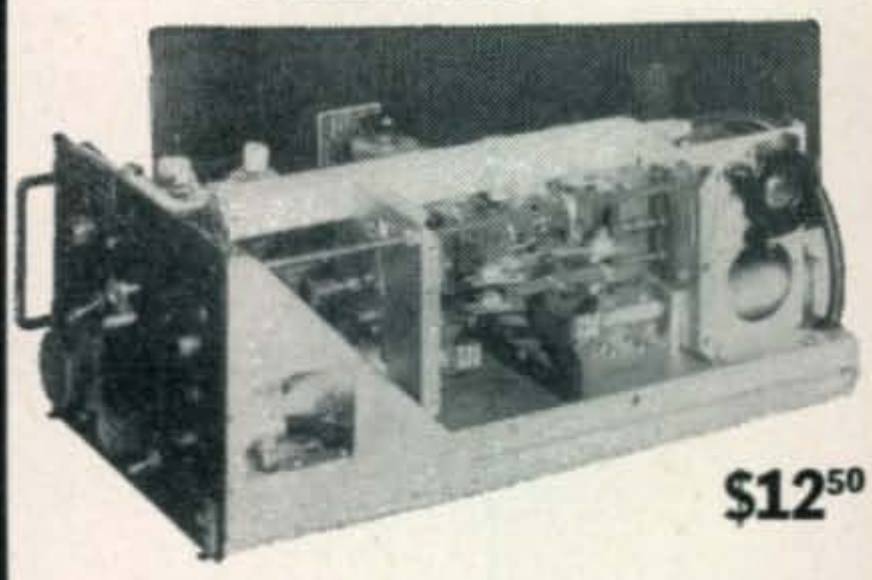


A—Relay, (Leach) type 1253-DEW, 24 V. DC 160 ohms DPST (New)..... .50
B—Relay, 110 V. 6 cy. AC plunge type for door interlock (New)..... .85
D—Relay (RBM) 110 V. 60 cy. AC operated DPST (New)..... .75
E—Relay, 6 meg. 5000 ohm DC resistance SPDT..... .85
F—Relay, (Leach) type 1127-FR 110 V. 60 cy. DPST (New)..... .75

TELRAD 18-A FREQUENCY STANDARD

Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply is 110, 130, 150, 220, and 250 V. 25-60 cycle AC. Complete with tubes, dual crystal, and instruction book. Brand new. Price..... **$24.95**

T-39/APQ-9 Radar Transmitter



$12.50

Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes; ceramic switch, potentiometers, gears, revolution counter, etc.

RECTIFIER RA-63-A

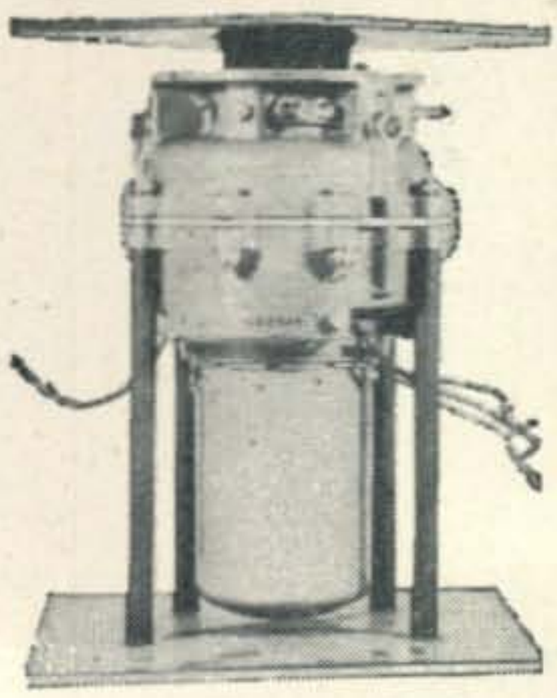
Battery charger or rectifier or power supply units. 110 V. 60 cy. input; 12 V. 8 amp. output. (New)

$19.75

ROTATOR MOTOR FOR YOUR BEAM ANTENNA

$11.95

As pictured on left



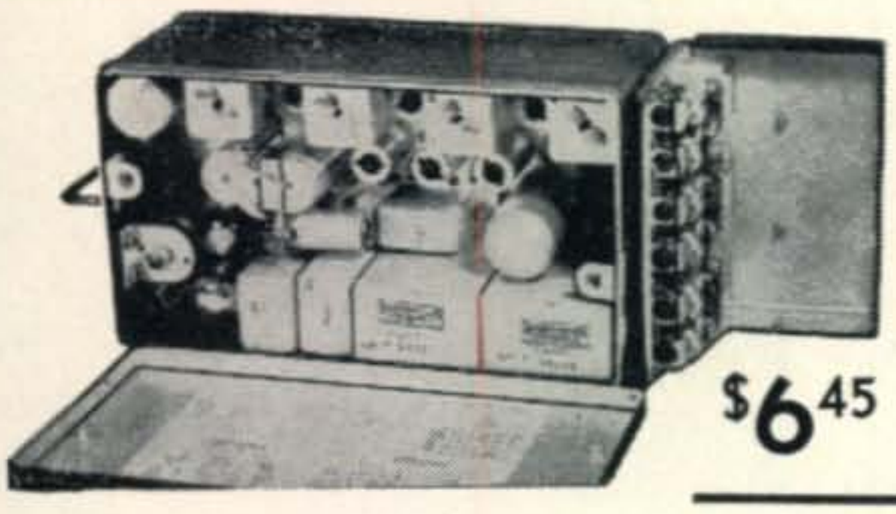
24–32 V. AC or DC operated. Reversible—only 3 wires required. Approximately ¾ RPM. 7056 to 1 gear reduction (no free swing). Powerful motor. Rugged precision gear train, and sturdy thrust bearing—will support and turn any ham beam. Weatherproof housing. Motors are easily converted into an FB beam rotator! Conversion data included.

Motor with antenna mounting plates welded on ..... **$6.00** extra
Selsyn transformer for Selsyn indicators, 110 V. AC input, 25 V. AC output **$2.75**
Transformer for beam motor, 110 V. AC input, 2–12 v. Secondary windings. Rating 11 amps. **$4.95**

SELSYN INDICATORS

For use with beam rotators for indication of direction of beam. Operate from 15-24 V. 60-cycle AC supply. Wiring instructions.

large model 5" diameter **$3.85**
small model 3" diameter **$2.85**



R-89/ARN 5A GLIDE PATH RECEIVER

$6.45

Formerly used for blind landing but adaptable to many other uses such as receiver for new police or citizen's band. Band of operation 326-335 mc. on any of three pre-determined crystal controlled frequencies. Contains eleven tubes, 6 relays and other valuable parts. For 24 V. DC operation. Size 13¾" x 5¼" x 6⅜"

Price, complete as shown **$6.45**

2-METER BEAM ANTENNA

Portable or fixed, manually operated or can be used with beam motor, for use in 100-156 Mc. band. Easily adapted for ham or experimantal use. Contains tuning unit which matches output of transmitter to antenna, 18' steel mast with brass tube containing co-ax cable and fittings inside steel mast (CD color), "H" frame for holding dipoles, 3 sets (4 per set) dipole rods, compensator or sense antenna for "H" frame, 2 steel truncated cones used as antenna support and feed-through, 360 degrees bearing indicator, and hand-wheel for rotating.

Brand new packed in six boxes, total weight approx. 600 lbs. Limited quantity and in much demand. Place order now.

PRICE **$79.50**

ANTENNA KIT 2A-264-126

Canvas bag containing 20 ceramic insulators each 3" long (1¼" dia. with screw-in type eyelets), covered wires each 5' long, 10' long, 35' long, 2 each 25' long, 5 each 20' long, 150' long, (all having ⅛" thimbles and 6" connecting leads at each end and all stranded copper covered with weather proof insulation.) Brand new. Original crates. Useful to any ham, serviceman, or experimenter. Each kit **$4.95**

OXYGEN TANKS

Aviators oxygen breathing bottles. Non-shatterable. Choice of two types.

(A) Withstands 2000 lbs. pressure.

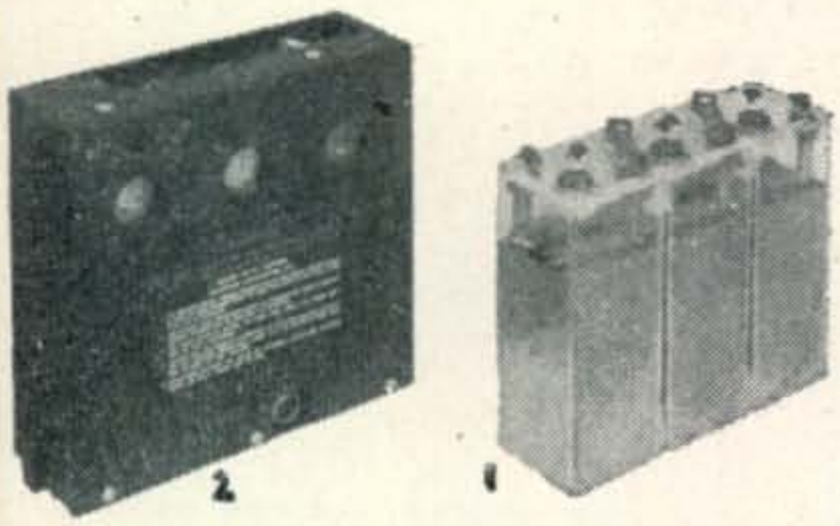
(B) Withstands 500 lbs. pressure.

6.95

A

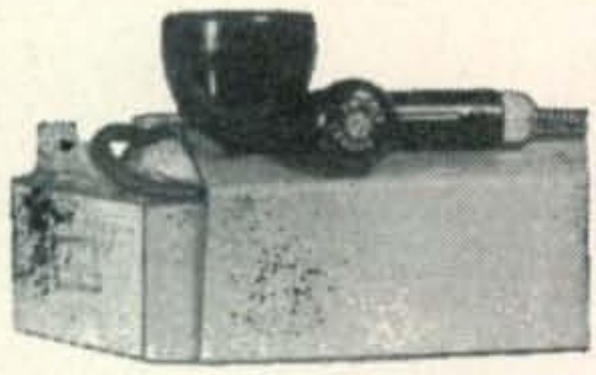
B

WILLARD LEAD ACID CELLS



6 V. (New) (Dry-charged) **$3.00**

6 V. (In metal carrying case) (Add electrolyte specific gravity 1.625) (Drugstore). **$4.00**



T-17-B CARBON MICROPHONES

(Handmike) (New) **1.35**

GENERATOR CONTROL BOX

Contains one 2½" round 0-300 AC voltmeter and one 2½' round 30-0-30 DC ammeter. Also plug, switch, relay, condensers and choke coil. (New) **5.85**

LANDING LIGHTS

24 V. retractable 600 watts..... **$3.95**

Lapp 800 lb. safe working load insulators

.95

Lapp heavy duty insulator with strap mounts.

1.65

SETCHEL-CARLSEN RECEIVER BC-1206-C

24-28 V. DC. Tubes, 3-14H7; 1-4R7; 2-8D7; 195-400Kc. Size, 4" x 4" x 6⅝" wide. 4 lbs. With manual (New, in cartons)

5.95

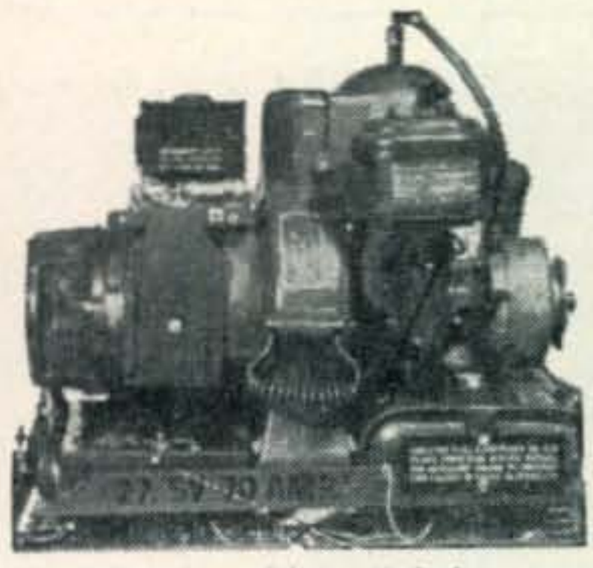
ALL ARTICLES ADVERTISED HEREIN - ARE SUBJECT TO PRIOR SALE - ALL PRICES SUBJECT TO CHANGE AFTER 30 DAYS

BC-348 Communications Receiver $69.50

6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition.

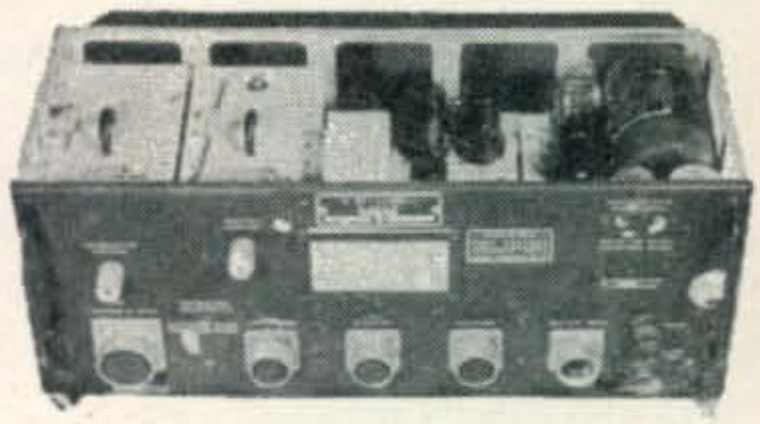
BC-348, 110 V. AC power supply, including simple conversion instructions. Complete with tube..... $8.95

(HRU) DC POWER SUPPLY



24-28 V. at 70 amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, start airplane engines, charge batteries, as a welding machine, lighting system, or for amateur radio station. 21½", 17½" x 24⅝". Wgt., 115 lbs. **72.50**

APN-1 RADIO ALTIMETER

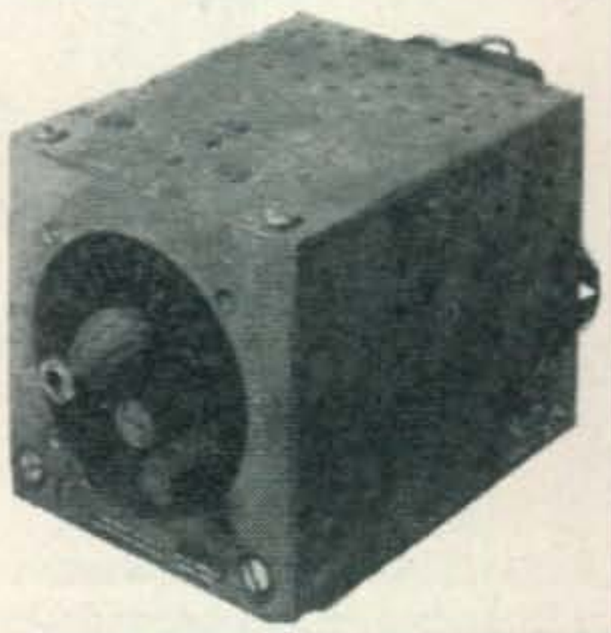


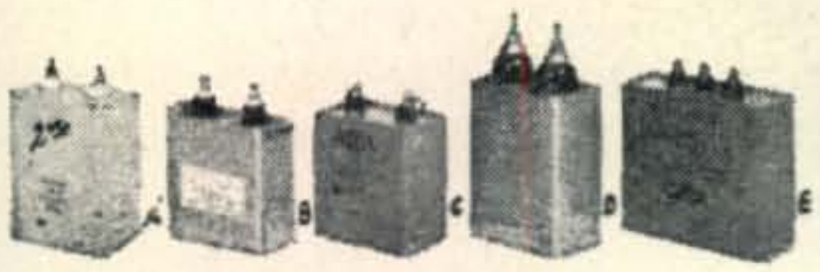
A complete 460 Mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6, 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V. dynamotor, transformers, pots, condensers, etc. make this a buy on which you cannot go wrong. Complete as shown in aluminum case 18" x 7" x 7¼"..... **8.95**

DETROLA AIRCRAFT RECEIVER

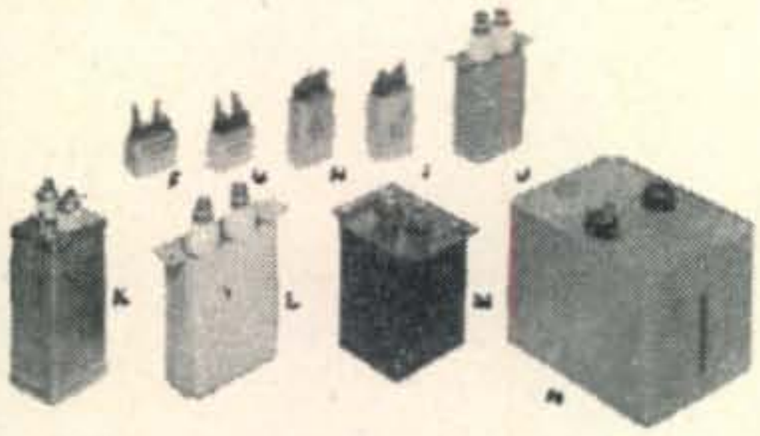
28 V. DC operated 200 - 400 Kc. Good condition.

3.75





A—Cond. (Solar) 10 Mfd. 1000 V. (New) . . **2.00**
B—Cond. (GE Pyranol) 8 Mfd. 1000 V. DC. (New) **1.75**
C—Cond. (Chi. Ind. Cond. Corp.) 4 Mfd. 2000 V. (New) **2.50**
D—Cond. (Cornell-Dubilier) 1 Mfd. 4000 V. (New) **3.00**
E—Cond. (Chi. Ind. Cond. Corp.) Dual 8.5 Mfd. 1000 V. (New) **3.50**

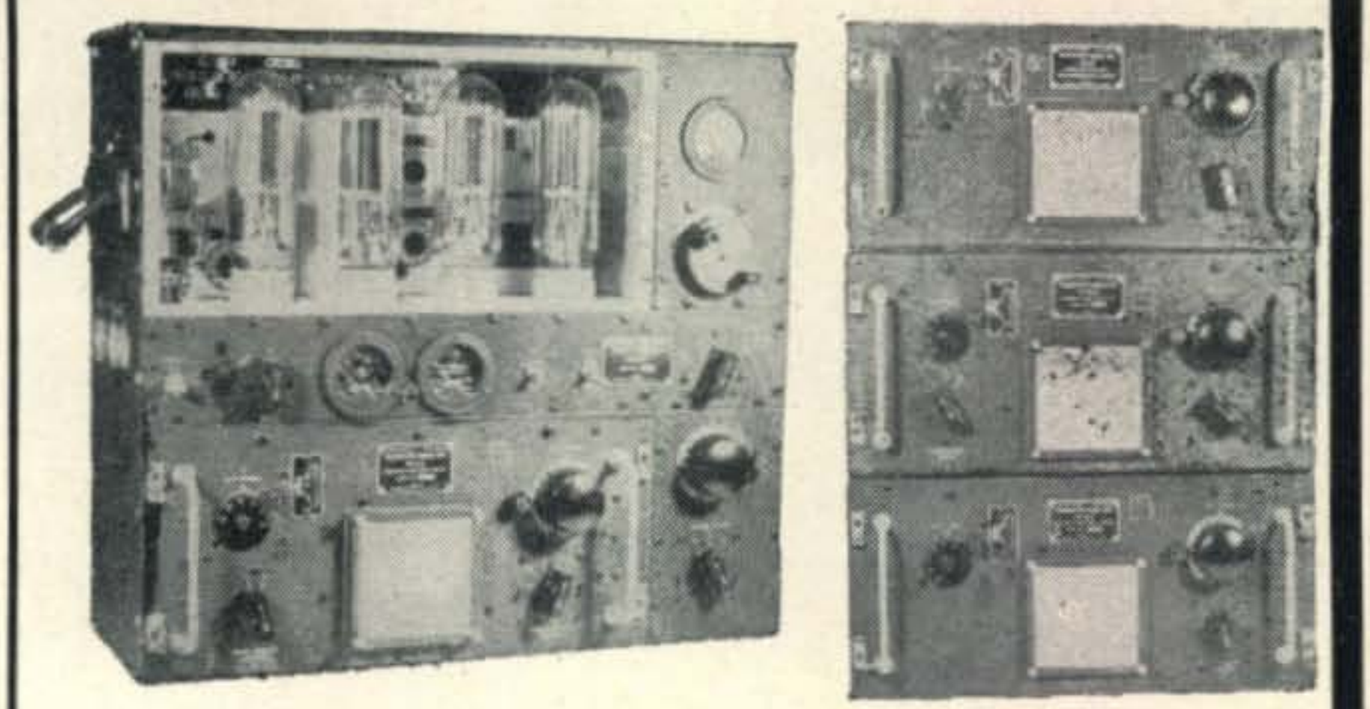


F—Cond., .25 Mfd. 400 V. (New) . . . . . **.10**
G—Cond., .125 Mfd. 400 V. (metal cased) (dual condenser) (New) . . . . . **.15**
H—Cond., 1.75 Mfd. 50 V. (New) . . . . . **.15**
J—Cond., (GE Pyranol) 2 Mfd. 600 V. (New) . . . . . **.50**
L—Cond., 4 Mfd. 600 V. DC (GE Pyranol) (New) . . . . . **.50**
M—Cond., 4 Mfd. 300 V. (New) . . . . . **.35**
N—Cond., 30 Mfd. 330 V. AC (GE Pyranol) (New) **3.00**

ALL ARTICLES ADVERTISED HEREIN ARE SUBJECT TO PRIOR SALE—ALL PRICES SUBJECT TO CHANGE AFTER 30 DAYS!

A—Resistor kit composed of 150 or more assorted wattages. Containing various resistors of up to 10 megohms. Many with gold bands. An honest-to-goodness bargain . . . . . Box **2.65**
B—Condenser Kit. Contains assortment of 25 various condensers including 2-2Mfd. 600 V. filters, 1-1000 Mfd. 15 V. filter 4-1 Mfd. 400 V. paper by-pass, 3-3 gang midget trimmers. etc. **2.65**
C—Hardware Kit containing about 5 lbs. of radio hardware including nuts, bolts, washers, shafts, gears, grommets, lugs, screws, spacers. It is a gold-mine of invaluable parts **1.95**

D—Resistor mounting lugs and terminal strip kit. Assorted sizes and shapes. Many, Many, Many **1.00**
E—Tube Socket Kit. 25 or more assorted sockets having various usable sizes. **1.50**
F—Switch Kit consisting of assortment of 10 rotary and toggle switches. Price **1.25**



BC-375 GE MOPA TRANSMITTER

The most famous of all surplus transmitters. Was used by the Army bombers and ground stations during the War. Frequency range is covered by means of plug-in tuning units as shown below. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. **Frequency Range:** 200-500 Kc. and 1500-12,500 Kc. (Will operate on 10 and 20 meter band with slight modification.) **Oscillator:** self-excited, thermo-compensated, and hand calibrated. **Power Amplifier:** neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. **Modulator:** Class "B"—uses two 211 tubes. **Power Supply:** Dynamotor which furnishes 1000 V. at 350 Ma. **Conversion** instructions and diagram for 110 V. AC furnished upon request for **$1.00.**

PRICES: As follows—

Transmitter only **$12.50**
Tuning units TU-5B, TU-7B, TU-8B, TU-9B, TU-10B, TU-26B, choice **$2.50**
Dynamotor PE-73C **$3.95**
Antenna tuning unit (BC-306A) **$4.95**

INTERVALOMETER

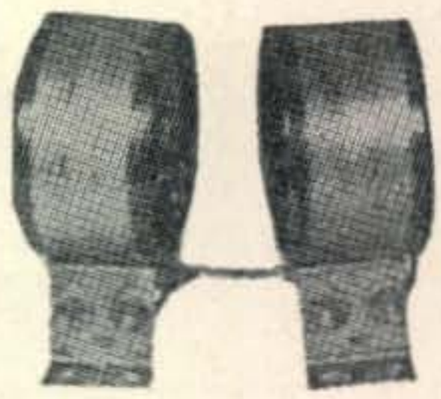
Electronic timing device. Was used for releasing bombs at intervals. Ideal for dark-room timer, model train controller. (Contains relays, switches, pilot lights resistors, knobs, etc.)

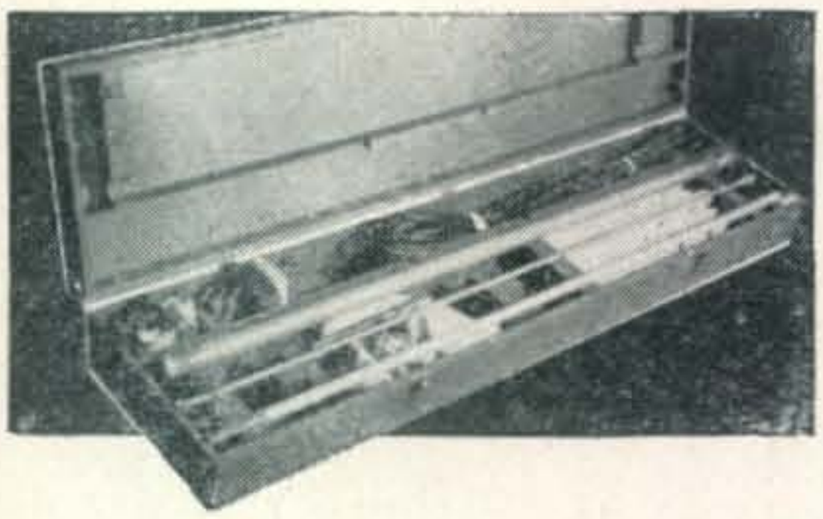
Price **$2.25**

TUBE HEATERS

Can be used for various purposes.

Price . . . . . **.75**



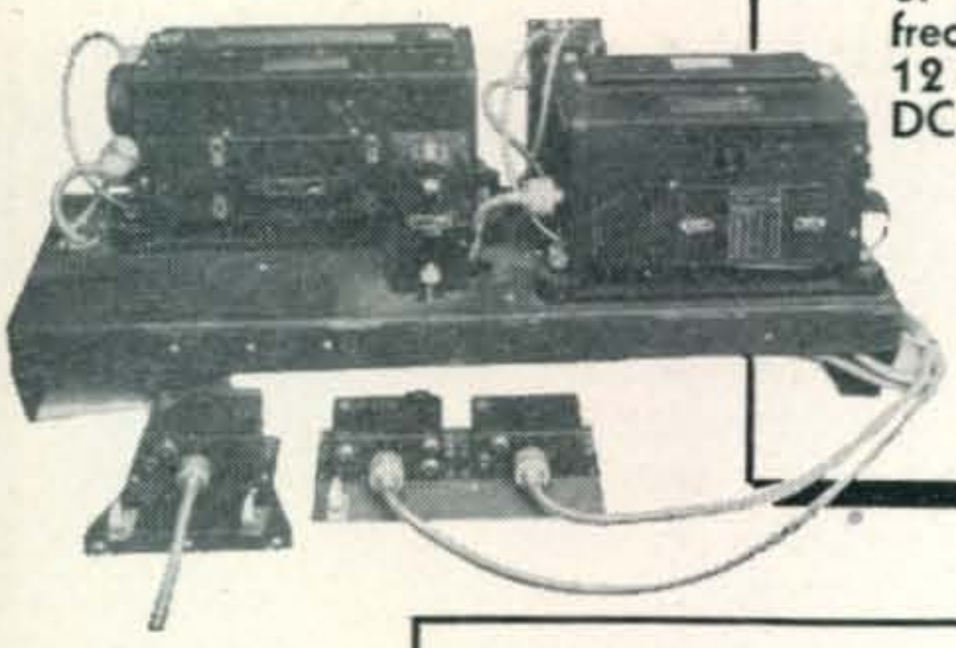


UHF MOTOROLA ANTENNA

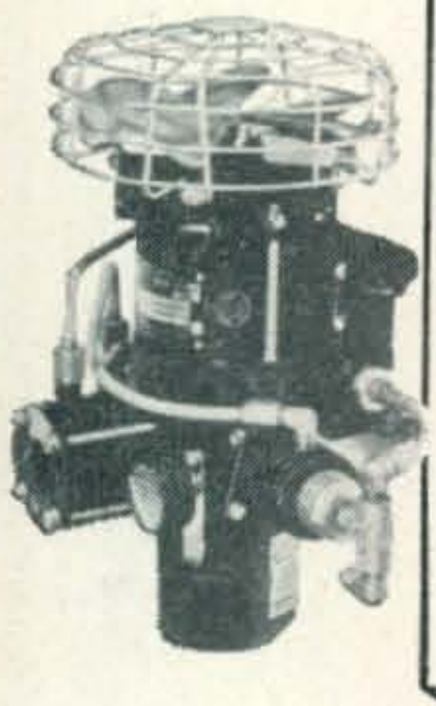
Antenna for 27-42 Mc. complete with matching section. 100 ft. Amphenal transmission line, guy wires and 8 ft. shipping box as shown.

Brand new. ea. **$35.00**

RU - 16GF - 11



Transmitter and receiver—12 V.; transmitter frequency 3000-4525 and 6000-9050 Kc.—frequency changes by means of plug-in coils; receiver frequency 195-13,575 Kc.—frequency changes by means of plug-in coils; power output 12 watts on voice, CW, or MCW; dynamotor input 12 V. DC at 10 amps.—output 435 V. at 143 Ma., well filtered. Mounted on rack 13" x 31" (transmitter and receiver shock-mounted.) Has rec., remote tuning control with cable, junction box, receiver switch box, test meter and antenna relay unit, instruction manual, all coils, and tubes. Wgt. approx. 100 lbs. Only a few left at this bargain price..... **$49.75**



AIR COMPRESSOR

Will pump pressure up to 1500 lbs. per sq. in. 3-stage type—air-cooled, powered by a 24 V. DC motor. Ideal in shop for use with airgun, small paint sprayer, and numerous other applications. Small, compact, precision - built. Only **$12.95**

CO-AXIAL CABLE VALUES

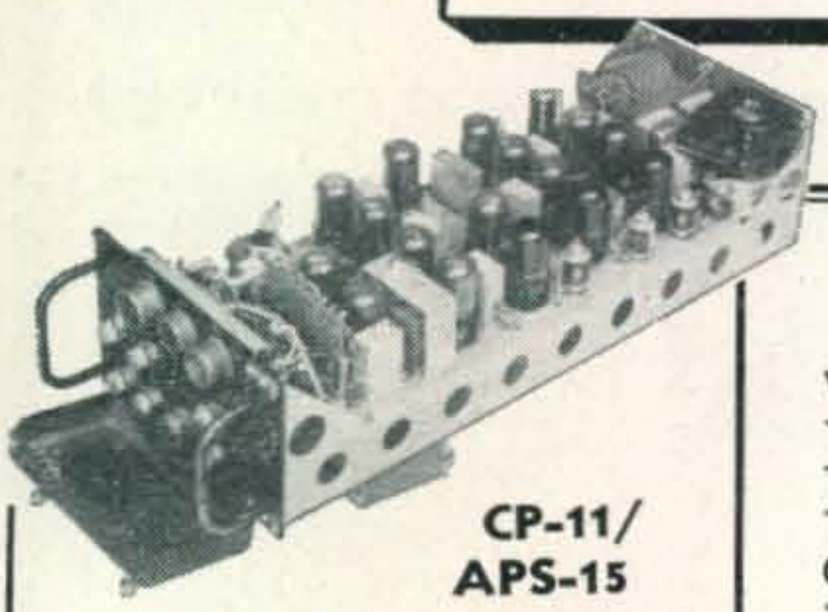
CO-AXIAL CABLE VALUES THAT WE CAN ONLY OFFER TO CUSTOMERS WHO BUY A MINIMUM OF 100 FOOT PER TYPE

RG-8/U cable 52 ohms impedance (unmarked) ..... **$2.95** per 100 foot

RG-8/U cable 52 ohms impedance (marked) ..... **$3.95** per 100 foot

RG-29/UCO-AXIAL 53.5 ohms impedance (marked) ..... **$3.95** per 100 foot

RG-21/U cable 53 ohms Impedance (unmarked) ..... **$3.95** per 100 foot



CP-11/ APS-15

Contains 13—6SN7-GT's, 3 6SA7-GT's, 1—5Y3-GT; 24 V. motor and blower (will operate on 110 V. 60 cy.); 4—one megohm precision wire-bound resistors; 80—86 Kc. crystal. Wgt. approx. 25 lbs. Price.... **$9.95**

RADIO TUBES

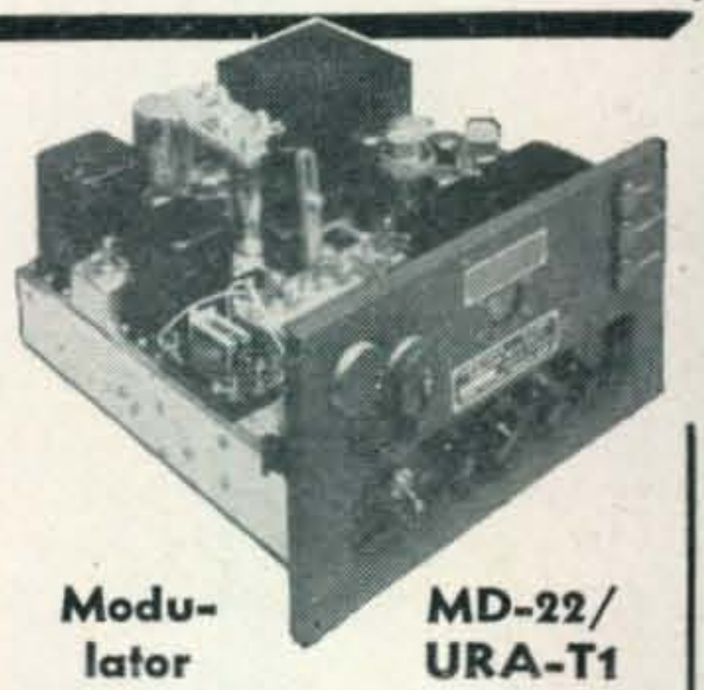
We're overstocked—we're unloading

7C5	each—	**$.35**
7F7	each—	**.35**
7Y4	each—	**.35**
CW-931	each—	**.35**
30 (VT-67)	each—	**.35**

(Hi-freq.-low-loss base)

6SN7	each—	**.35**
VT127A	each—	**3.75**
OZ4	each—	**.70**
12A6	each—	**.35**
1625	each—	**.35**
1629	each—	**.35**

All tubes checked before shipment.



Modulator

MD-22/ URA-T1

Has metal case—7"x12"x16", 6 or 12 V. DC or 110 V. 60 cy. AC. Used by Army for jamming, by random noises, keying, or bagpipe systems. 1—6SN7, 1—6V6, 1—6X5, 1—2050, and 3—991 tubes; jacks for microphone; output monitoring or connection to transmitter. Price **$12.95**

RBL-2
RADIO RECEIVER
Navy Type CNA-46161

Built by National Company, these are brand-new and come complete with tubes and ready to operate except for connection to phones speaker. It is a 7-tube tuned radio frequency receiver covering 15 to 600 KC in six bands. The circuit employs both low and high pass filters and adjustable audio limiter.

Tubes used: 3-6SK7, 1-6SG7, 1-6H6, 1-6K6GT/G and 1-5U4G.

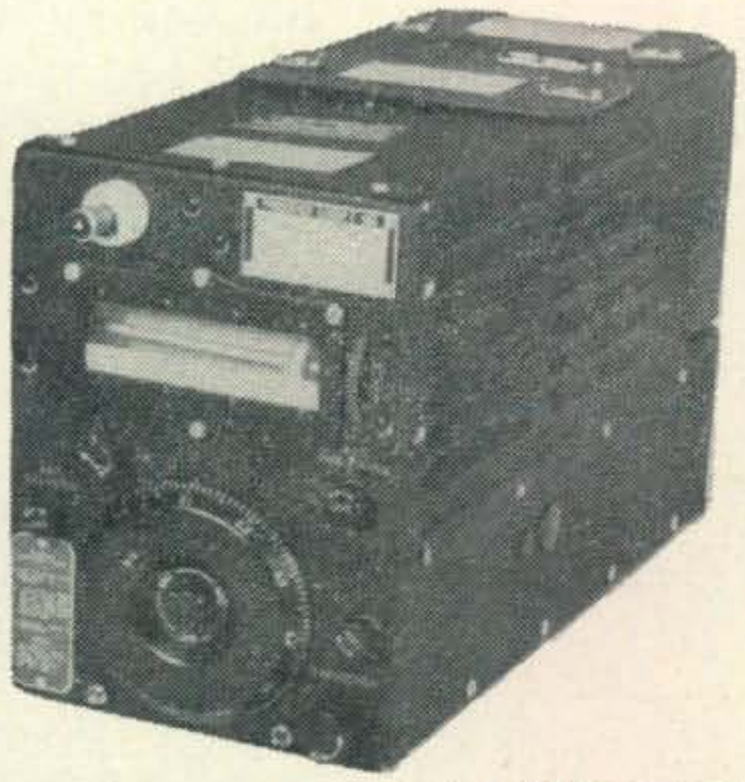
Operates from 110 V. 50/60 cycle AC source. Dimensions overall, 12 13/32" x 17 11/32" x 17¼". Weight, 80 lbs.

Price New..... $87.50 ea.

SCR274-N COMMAND SET COMPONENTS
Transmitters and Receivers for 10-Meter Rig.

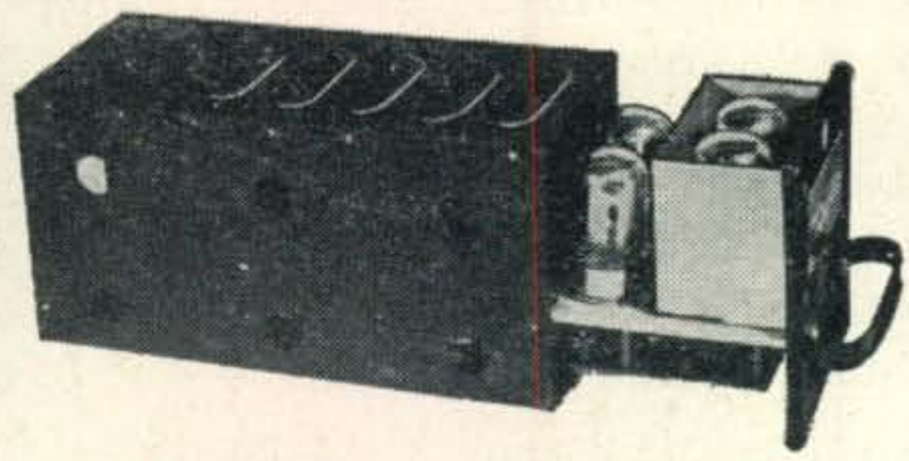
Refer to CQ magazine for May 1946 for conversion information of these units. This outfit can be made into a sensational amateur radio station. We are featuring and pricing the components separately so that you may buy what you want instead of what you do not need.

Modulator with carbon mike input (with dynamotor) $5.75. Tuning Control Box (gang of three) $2.50. Antenna Unit with relay 5000 volt 50 MMFD. condenser and Meter $2.25 Remote control box with switch and volume control $1.50. Receiver rack (set of three) $1.50. Transmitter rack (set of two), $1.00.



RECEIVERS: 3-6 MC $5.75; 6-9.1 MC $5.75

TRANSMITTERS: 4-5.3 MC $5.75; 5.3-7 MC $5.75



TURBO AMPLIFIER

Used for parts—shipped complete with the following tubes:

2.....7 C5's
1.....7 Y4
1.....7 F7

Price.....$1.75 ea.

AIRCRAFT SUPPLIES

These instruments have all been tested for accuracy.

Gyro-horizons	$ 7.50
Magnetic Compasses	6.00
MN-26 Radio Compass. (Brand new)	69.50
SCR-269F Radio Compass. (Brand new)	69.50
Astro Compass.	

These are beautiful instruments that should sell on the regular market for many, many times our price. They have various uses including those of the yachtsman as well as the airman. If you desire, send for more complete descriptive literature. **$11.50**

NAVY TDE-2

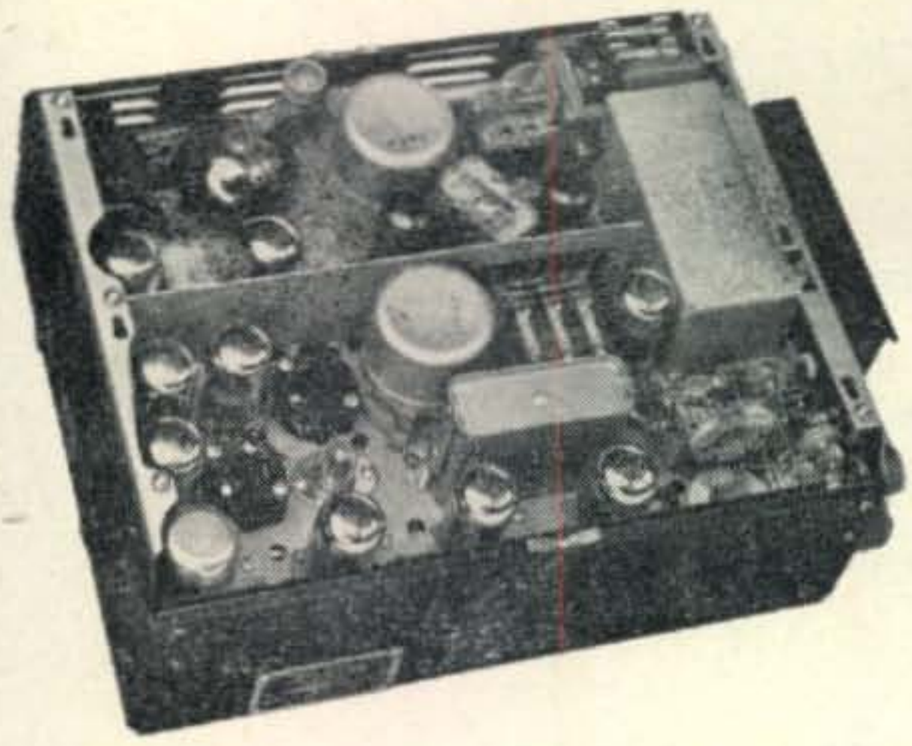
A Sensational Transmitter Offer . . .

Here is a real job, not only in professional equipment, but in size and looks which will really make a ham shack look efficient, as well as having an efficient transmitter. Westinghouse-made Navy model TDE-2 CW, MCW and radiophone transmitter consisting of two transmitters, one of intermediate frequency from 300 to 1500 kilocycles, the other high frequency of 1500 to 18,100 kilocycles. The rated power output is 125 watts, CW, 35 watts MCW, 30 watts voice. Uses the following tubes: 1–837 HF VFO, 1–807HF Int. Amp., 1–801 IF MO, 1–807 IF Int. Amp., 1–803 I. F. P. A., 1–801 Audio Amp., 1–5Y4G bias Rec. A unit that is designed for ship or shore operation on 115 v. DC, 230 v. DC, or 220/440 v. 3 phase 60 cycle power supply.

These transmitters have motor generator and bias power supply. Can be easily converted to 110 V. operation by changing motor of motor-generator set. Set has 7 meters, vernier tuning controls, and is rack-mounted in heavy steel cabinet. Overall dimensions 67½″ tall, 26½″ wide, 20½′ deep. Uncrated weight approximately 1350 pounds. A Real buy, so hurry. Limited quantity.

$685.00

VIEW OF NAVY TDE-2 TRANSMITTER-OPEN



BC-645 ULTRA HI-FREQUENCY TRANSMITTER-RECEIVER

You read about it recently in QST! Originally operated in the frequency band from 450 to 500 Mc. Can be converted to 420 Mc. amateur band. Consists of complete transmitter and modulator system, and receiver. Instructions for conversion to AC supply.
Complete, Brand New with 15 tubes, **$11.95**

MARKER-BEACON RECEIVER

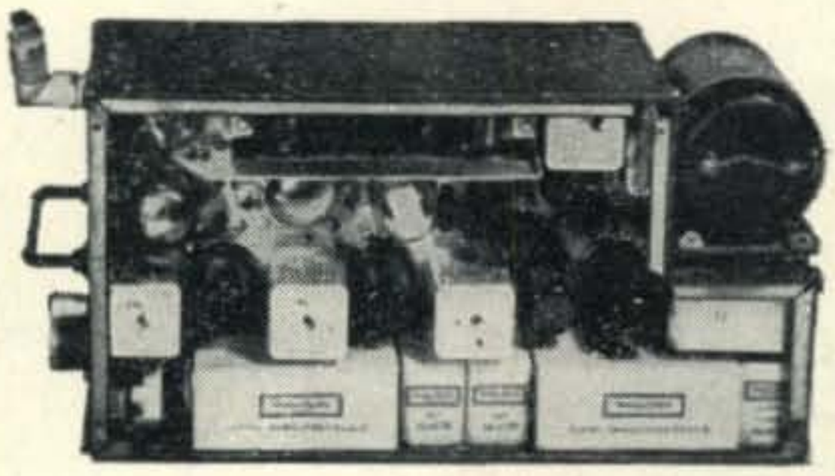
Can be adapted to radio controlled devices. Was used by pilots to flash a signal lamp on aircraft instrument panel when in range of a beacon transmitter. Responds to modulated signals over a variable range of 62 to 80 Mc. Tube plates and filaments operate directly from 24 V. DC. Can be adapted for radio control of experimental apparatus opening garage doors, etc. Circuit diagram and parts list included on either model shown below:

BC-357 — contains 12C8 and 12SQ7 tubes and sensitive relay (size 5⅜" x 5¼" x 3¼").
Price..... **$2.95**

BC-1033 — contains 6SH7, 6SL7 and 12SN7 tubes, sensitive relay (size 5⅜" x 5¼" x 3¼")
Price..... **$3.50**

BC-733D LOCALIZER RECEIVER

A part of aircraft blind landing equipment. Operates on any six of its predetermined crystal controlled frequencies in the range of 108-120 mc. Contains 10 tubes, three of which are WE-717-A's—and crystals. Ideal receiver for conversion to 144 mc. ham band or mobile telephone bands. For 24 V. DC operation. Size 14½" x 7" x 4⅝".

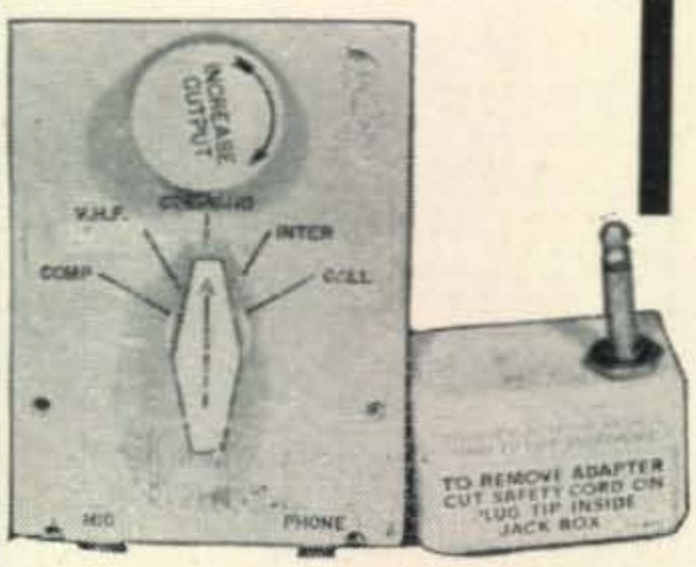


Price with dynamotor..... **$5.95**
Price without dynamotor..... **$4.95**

$6.95

C-1 AUTO PILOT AMPLIFIER

Were used to control operation of Servo-units, causing them to move the control surface of airplane in one direction or the other in response to signals received. The complete amplifier includes one rect. 7Y4, 3—7F7's for amplification and control, 3—7N7's for signal discrimination, 1 power transformer, 6 relays, 4 control pots, chokes, condensers, etc. Convert for use on radio controlled models, doors, etc. Operates from 24 V. DC. Size 9¼ x 6¼ x 7⅝". Complete.



JACK BOX BC-1366

Contains 2-pole 5-position switch, rheostat, two phone jacks, etc. In aluminum case 3¼" x 4⅜" x 2¼". Complete with headphone set adapter to match high to low impedance.
Price..... **$1.25**

AIRCRAFT RADIO RANGE FILTER

For helpful reduction of QRM on crowded CR bands. When attached to output of any communications receiver:

1 — Will pass signal of 1020 CPS, eliminating others.
2 — Will pass voice frequencies and eliminate 1020 CPS code signal.

Compact, light weight, with switch. Size 2¾" x 2⅝" x 3¾".
Price..... **$2.25**

REVISED COUNTRY LIST

COUNTRY	PREFIX	ZONE	CON'T
Aden and Socotra Island	VS9	21, 37	A, AF
Afghanistan	YA	21	A
Alaska	KL7	1	NA
Albania	ZA	15	E
Aldabra Islands		39	AF
Algeria	FA	33	AF
Andaman Is. and Nicobar Is.	(VU2)	26	A
Andorra	PX	14	E
Anglo-Egyptian Sudan	ST	34	AF
Angola	CR6	36	AF
Argentina	LU	13	SA
Ascension Island	ZD8	36	AF
Australia & Tasmania	VK	29, 30	O
Austria	OE (MB9)	15	E
Azores Islands	CT2	14	E
Bahama Islands	VP7	8	NA
Bahrein Island	VS8 (VU7)	21	A
Baker, Howland & Am. Phoenix Is. (Canton Is.)	KB6	31	O
Balearic Islands	EA6	14	E
Barbados	VP6	8	NA
Basutoland	ZS8	38	AF
Bechuanaland	ZS9	38	AF
Belgian Congo	OQ5	36	AF
Belgium	ON4	14	E
Bermuda Islands	VP9	5	NA
Bhutan		22	A
Bolivia	CP	10	SA
Bonin Islands & Volcano Islands (e.g., Iwo Jima)	J9	27	O
Borneo, British North	VS4	28	O
Borneo, Netherlands	PK5	28	O
Brazil	PY	11	SA
British Honduras	VP1	7	NA
Brunei	VS5	28	O
Bulgaria	LZ	20	E
Burma	XZ	26	A
Cameroons, British	ZD2	36	AF
Cameroons, French	FE8	36	AF
Canada	VE	1 to 5	NA
Canal Zone	KZ5	7	NA
Canary Islands	EA8	33	AF
Cape Verde Islands	CR4	35	AF
Caroline Islands		27	O
Cayman Islands	VP5	8	NA
Celebes & Molucca Is.	PK6	28	O
Ceylon	VS7	22	A
Chagos Islands	VQ8	39	AF
Channel Islands	GC	14	E
Chile	CE	12	SA
China	C	23, 24	A
Christmas Island	ZC3	29	O
Clipperton Island		7	NA
Cocos Island	TI	7	NA
Cocos Islands	ZC2	29	O
Colombia	HK	9	SA
Comoro Islands		39	AF
Cook Islands	ZK1	32	O
Corsica	(FC)	15	E
Costa Rica	TI	7	NA
Crete	SV	20	E
Cuba	CM, CO	8	NA
Cyprus	ZC4 (MD7)	20	A
Czechoslovakia	OK	15	E
Denmark	OZ	14	E
Dodecanese Is. (e.g., Rhodes)	SV5	20	E
Dominican Republic	HI	8	NA
Easter Island		12	SA
Ecuador	HC	10	SA
Egypt (Suez C. Z.)	SU (MD5)	34	AF
Eire (Irish Free State)	EI	14	E
England	G	14	E
Eritrea	MI6 (MD3)	37	AF
Ethiopia	ET	37	AF
Faeroes, The	OY	14	E
Falkland Islands	VP8	13	SA
Fanning Island (Christmas Is)	VR3	31	O
Fiji Islands	VR2	32	O
Finland	OH	15	E
Formosa (Taiwan)		24	A
France	F	14	E
French Equatorial Africa	FQ	36	AF
French India	FN	22	A
French Indo-China	FI8	26	A
French Oceania (e.g., Tahiti)	FO8	32	O
French West Africa	FF8	35	AF
Franz Josef Land	(UA1K)	40	E
Galapagos Islands		10	SA
Gambia	ZD3	35	AF
Germany	D	14	E
Gibraltar	ZB2	14	E
Gilbert & Ellice Is. & Ocean Is.	VR1	31	O
Goa (Portuguese India)	CR8	22	A
Gold Coast (and Brit. Togoland)	ZD4	35	AF
Greece	SV	20	E
Greenland	OX	40	NA
Guadeloupe	FG8	8	NA
Guantanamo Bay	NY4	8	NA
Guatemala	TG	7	NA
Guiana, British	VP3	9	SA
Guiana, Neth. (Surinam)	PZ	9	SA
Guiana, French, and Inini	FY8	9	SA
Guinea, Portuguese	CR5	35	AF
Guinea, Spanish		36	AF
Haiti	HH	8	NA
Hawaiian Islands	KH6	31	O
Honduras	HR	7	NA
Hong Kong	VS6	24	A
Hungary	HA	15	E
Iceland	TF	40	E
Ifni		33	AF
India	VU	22	A
Iran	EP, EQ	21	A
Iraq	YI (MD6)	21	A
Isle of Man	GD	14	E
Ireland, Northern	GI	14	E
Italy	I	15	E
Jamaica	VP5	8	NA
Jan Mayen Island		40	E
Japan	J	25	A
Jarvis Island, Palmyra group (Christmas Island)	KP6	31	O
Java	PK1, 2, 3	28	O
Johnston Island	KJ6	31	O
Kenya	VQ4	37	AF
Kerguelen Islands		39	AF
Korea	HL	25	A
Kuwait		21	A
Laccadive Islands	VU4	22	A
Lebanon	AR8	20	A
Leeward Islands	VP2	8	NA
Liberia	EL	35	AF
Libya	MD1, 2	34	AF
Liechtenstein	HE1	14	E

USE BOB HENRY'S PERSONAL SERVICE

I personally promise that you can find nowhere else lower prices, more complete stocks, quicker delivery, easier terms or more generous trade-ins. I give you 10-day free trial and 90-day free service. You can't go wrong in dealing with me because I personally guarantee that you will be completely satisfied on every deal. Write, wire or phone me today.

Bob Henry
W◊ARA

A FEW OF THE ITEMS WE STOCK ARE LISTED BELOW

Collins 75A-1	$375.00
Hallicrafters S38	47.50
Hallicrafters S40A	89.50
Hallicrafters SX43	169.50
Hallicrafters SX42	275.00
Hallicrafters SP44	49.50
Hallicrafters HT18	110.00
Hallicrafters HT9	350.00
National NC57	89.50
National NC173	179.50
National NC183	269.00
National NC240D	225.00
National HRO-7	279.00
Hammarlund HQ129X	177.30
Hammarlund SPC400X	398.25
Hammarlund Four-20	120.00
Hammarlund Four-11	72.50
RME 84	98.70
RME 45	198.70
RME VHF152A	86.60
RME HF-10-20	77.00
RME DB22A	66.00
Collins 32V1	475.00
Meck T60	150.00
Signal Shifter model EX	99.50
Bud VFO-21	52.50
Millen 90800 exciter	42.50
Millen 90700 VFO	42.50
Millen 90281	84.50
Millen 90881	89.50
Millen 90810	69.75

McMurdo Silver, Sonar, Gordon, Premax, Workshop, Gonset; we have everything.

Prices slightly higher on the West Coast.

COMPLETE STOCKS

Henry has *everything* in the ham field.

QUICK DELIVERY

Shipments *4 hours* after receipt of order. Send $5.00 with order and shipment will be made at once C.O.D.

TRADE-INS

You can't beat Bob Henry for trade-ins. Write, wire or phone today about your equipment and Bob Henry will make you a better offer than you can get anywhere else.

TIME PAYMENT

Because Bob Henry finances the terms himself you get a better break. Save time and money, deal with Bob Henry on his personal, profitable time payment plan.

Orders and inquiries from outside U.S.A. welcome.

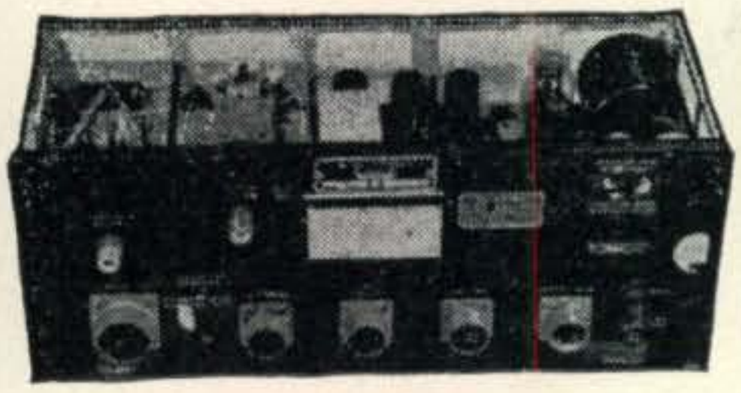
Butler, Missouri **HENRY RADIO STORES** Los Angeles 25, Calif.

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

COUNTRY	PREFIX	ZONE	CON'T
Little America	KC4	13	SA
Luxembourg	LX	14	E
Macau	CR9	24	A
Madagascar	FB8	39	AF
Madeira Islands	CT3	33	AF
Malaya	VS1, VS2	28	A
Maldive Islands	(VS9)	22	A
Malta	ZB1	15	E
Manchuria	C9	24	A
Marianas Islands, (e.g., Guam, Tinian, Saipan)	KG6	27	O
Marshall Islands	KX6	31	O
Martinique	FM8	8	NA
Mauritius	VQ8	39	AF
Mexico	XE	6	NA
Midway Island	KM6	31	O
Miquelon & St. Pierre Is.	FP8	5	NA
Monaco		14	E
Mongolia		23	A
Morocco, French	CN	33	AF
Morocco, Spanish	EA9	33	AF
Mozambique	CR7	37	AF
Nepal		22	A
Netherlands	PA(PI)	14	E
Netherlands West Indies	PJ	9	SA
New Caledonia	FK8	32	O
Newfoundland & Labrador	VO	2, 5	NA
New Guinea, Netherlands	PK7	28	O
New Guinea, Territory of	VK9	28	O
New Hebrides	FU8 & YJ1	32	O
New Zealand	ZL	32	O
Nicaragua	YN	7	NA
Nigeria	ZD2	35	AF
Niue	ZK2	32	O
Norway	LA(LB)	14	E
Nyasaland	ZD6	37	AF
Oman	(VS9)	21	A
Pakistan	(VU)	21, 22	A
Palau (Pelew) Islands		27	O
Palestine	ZC6	20	A
Panama	HP	7	NA
Papua Territory	VK9	28	O
Paraguay	ZP	11	SA
Peru	OA	10	SA
Philippine Islands	KA	27	O
Phoenix Islands (British)		31	O
Pitcairn Island	VR6	32	O
Poland	SP	15	E
Portugal	CT1	14	E
Principe & Sao Thome Is.		36	AF
Puerto Rico	KP4	8	NA
Reunion Island	FR8	39	AF
Rhodesia, Northern	VQ2	36	AF
Rhodesia, Southern	ZE	38	AF
Rio de Oro		33	AF
Roumania	YR	20	E
Ryukyu Is.(e.g.,Okinawa)	J9	25	A
St. Helena	ZD7	36	AF
Salvador	YS	7	NA
Samoa, American	KS6	32	O
Samoa, Western	ZM	32	O
San Marino	(M1)	15	E
Sarawak	VS5	28	O
Sardinia	I	15	E
Saudi Arabia (Hedjaz and Nejd)	HZ	21	A
Scotland	GM	14	E
Seychelles	VQ9	39	AF
Siam	HS	26	A
Sierra Leone	ZD1	35	AF
Sikkim	(AC3)	22	A
Solomon Islands	VR4	28	O
Somaliland, British	VQ6	37	AF
Somaliland, French	FL8	37	AF
Somaliland, Italian	(MD4)	37	AF
South Georgia	VP8	13	SA
South Orkney Islands	VP8 & LU1Z	13	SA
South Sandwich Islands	VP8	13	SA
South Shetland Islands	VP8	13	SA
Southwest Africa	ZS3	38	AF
Soviet Union:			
European Russian Socialist Federated Soviet Republic	UA1, 3, 4, 6	16	E
Asiatic Russian S.F.S.R.	UA9 Ø	17,18,19	A
Ukraine	UB5	16	E
White Russian S.S.R.	UC2	16	E
Azerbaijan	UD6	21	A
Georgia	UF6	21	A
Armenia	UG6	21	A
Turkoman	UH8	17	A
Uzbek	UI8	17	A
Tadzhik	UJ8	17	A
Kazakh	UL7	17	A
Kirghiz	UM8	17	A
Karelo-Finnish Republic	UN1	16	E
Moldavia	UO5	16	E
Lithuania	UP2	15	E
Latvia	UQ2	15	E
Estonia	UR2	15	E
Spain	EA	14	E
Sumatra	PK4	28	O
Svalbard (Spitzbergen)	(LA)	40	E
Swan Island	KS4	7	NA
Swaziland	ZS7	38	AF
Sweden	SM	14	E
Switzerland	HB	14	E
Syria	AR1	20	A
Tanganyika Territory	VQ3	37	AF
Tangier Zone	EK	33	AF
Tannu Tuva		23	A
Tibet	AC4	23	A
Timor, Portuguese	CR10	28	O
Togoland, French	FD8	35	AF
Tokelau (Union) Islands		31	O
Tonga (Friendly) Islands	VR5	32	O
Transjordan	ZC1	20	A
Trieste		15	E
Trinidad and Tobago	VP4	9	SA
Tristan da Cunha & Gough Island	ZD9	38	AF
Tunisia	FT4	35	AF
Turkey	TA	20	A
Turks and Caicos Islands	VP5	8	NA
Uganda	VQ5	37	AF
Union of South Africa	ZS	38	AF
United States of America	W, K	3, 4, 5	NA
Uruguay	CX	13	SA
Venezuela	YV	9	SA
Virgin Islands	KV4	8	NA
Wake Island	KW6	31	O
Wales	GW	14	E
Windward Islands	VP2	8	NA
Wrangel Islands		19	A
Yemen		21	A
Yugoslavia	YT, YU	15	E
Zanzibar	VQ1	37	AF

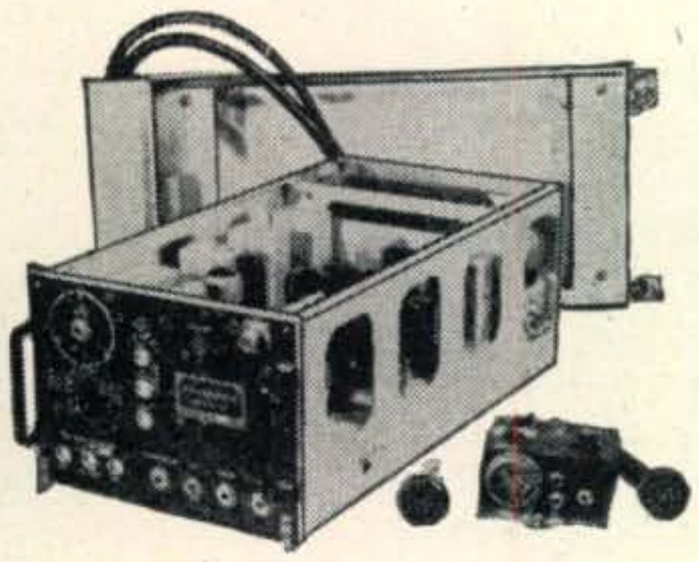
WAR SURPLUS BARGAINS Sold As Used Unless Otherwise Specified

RADIO ALTIMETER APN/1



A complete 460 mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6, 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V dynamotor transformers, pots condensers, etc., make this a buy on which you can not go wrong. Complete as shown in aluminum case 18"x7"x7¼"

$8.95

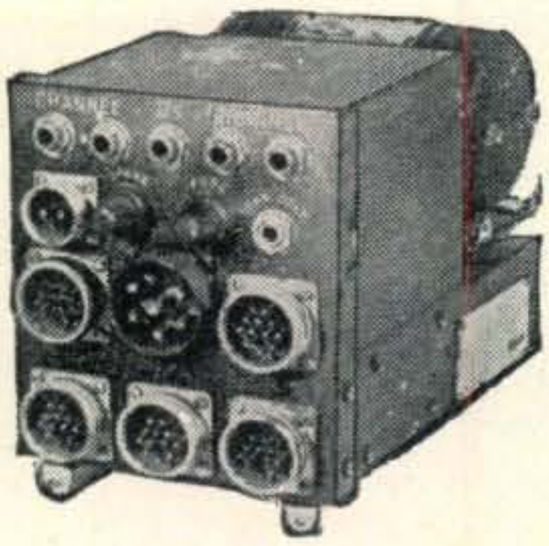


ARC-4 Transmitter and Rcvr.

Operates on any of its 4 predetermined crystal controlled frequencies in the range of 140 MC. Complete with tubes, remote control, junction box, shock mounting base and connecting plugs. This unit is ideal for amateur UHF or mobile telephone. Operates from self-contained 24 V DC dynamotor.

$17.95

INCLUDING CASE



Interphone Amplifier RL-7

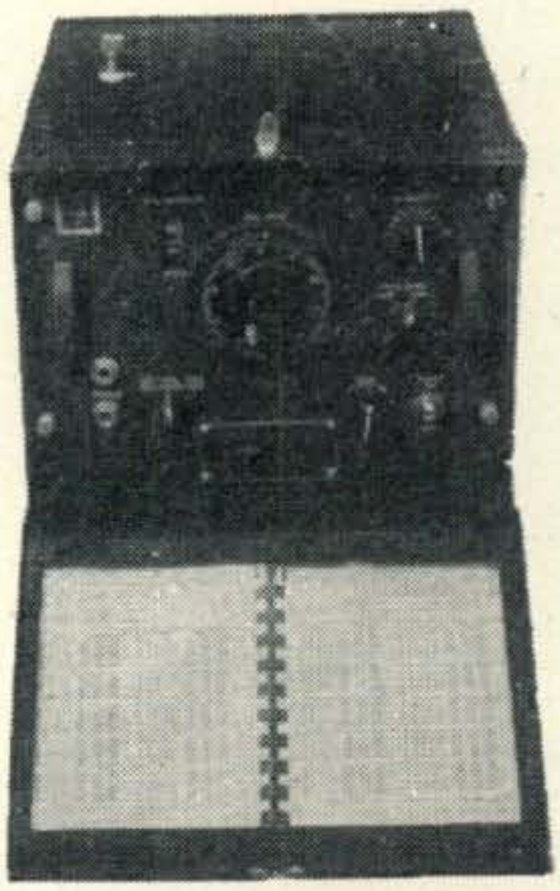
Convert to high fidelity phone Amp. or speech Amp. Complete with tubes and dynamotor, for 24 V. DC operation. Used but in good condition.

Special Price **$1.95**

BC-348 Communication Receiver

Excellent selectivity, sensitivity and stability makes this the most outstanding of any receiver yet available from government surplus. This receiver will give outstanding performance wherever used. Built to withstand vibration and features gear driven 100-1 ratio vernier tuning control. Six bands—500 Kc. and 1.5-18 Mc. Two stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. DC dynamotor. Easily converted to 110 V. AC operation.
BC-348, 110 V. AC power supply, including simple conversion instructions **$8.95**

$69.50



BC-221 FREQ. METER

Covers 125-20,000 Kc. battery operated. Beautiful equipment.

$49.95

OXYGEN TANKS

These oxygen tanks, removed from surplus aircraft have a capacity of 500 lbs. pressure. Type D2, with complete regulator assembly. Size of tank 2" x 5". Wt. 7 lbs.

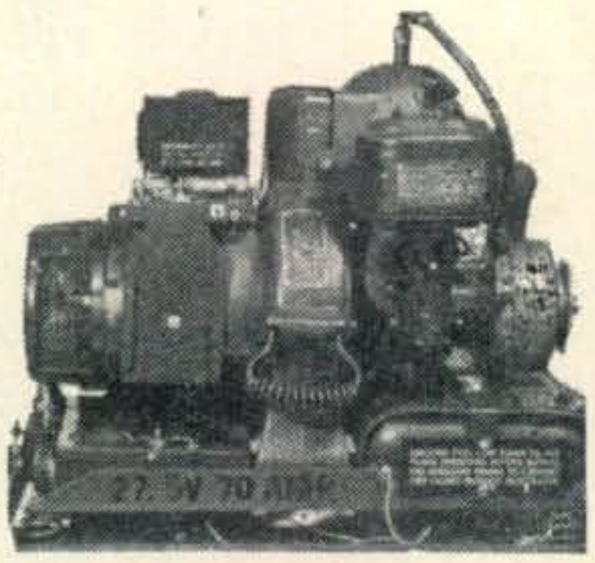
$5.95

Navy CRV-46151 Aircraft Radio Receiver

Four bands, including broadcast (195-9,050 KC). Circuit is six-tube superheterodyne with mechanical band change or remote operated electrical band change. Remote band change and tuning controls included, making this set readily adaptable to mobile ham use. Powered from self-contained 24 V. DC dynamotor.

The sets are complete with tubes, mounting rack and remote controls. No tables or prods.
Including case.....

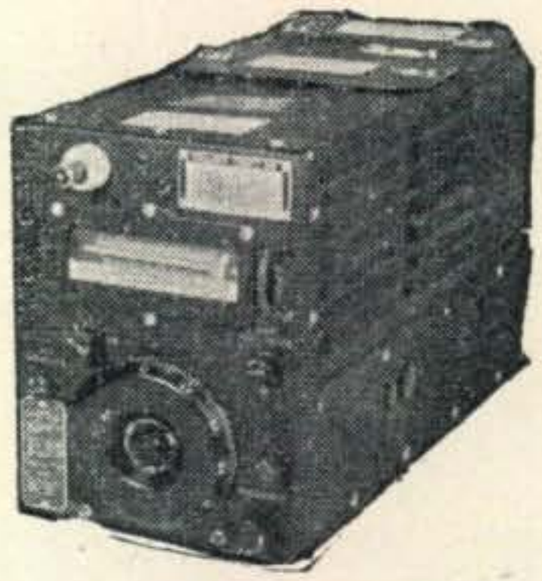
$19.50



(HRU) DC POWER SUPPLY

24-28 V. at 70 amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, start airplane engines, charge batteries, as welding machine, lighting system, or for amateur radio station. 21½"x 17½" x 24⅝". Wgt., 115 lbs. Includes 20 foot plug-in cable.

$72.50



AIRCRAFT TRANSMITTER BC-457A or BC-458A

Ideal to make over for master oscillator. Priced complete with tubes. Has built-in crystal for dial calibration. Used but in good condition. 5.3-7 MC or 4-5.3 MC. FREE Mounting Rack with order of two or more.
3-4 MC.....$5.75

$3.95

TERMS: CASH WITH ORDER

AMERICAN SURPLUS PRODUCTS CO.

537 N. CAPITOL AVE.
INDIANAPOLIS, IND.

This 2SL Situation

HENRY W. YAHNEL, W2SN*

1932	5,000	1937	35,716	1942	.....
1933	10,174	1938	38,530	1943	.....
1934	20,716	1939	35,545	1944	.....
1935	27,860	1940	3,785	1945	.....
1936	33,162	1941	520	1946	15,056
				1947	70,115
		Total	296,179		

FROM TIME TO TIME we see in the pages of one of the amateur publications that some studious member of our fraternity has carefully figured his average return of QSL cards. He has figured this against that, and when finished is both happy and proud over his handiwork, but just a bit disgruntled over the overall picture of his returns. Who is to blame?

As I look into my wastepaper basket, emptied only a couple of hours ago, I can see 25 or 30 cards, no doubt representing W.A.C. These are culled from a shipment of about 1500 cards from almost every country, received in the past two days, in about 15 or 20 separate bundles of various shapes and sizes and degrees of evidence of having weathered (or not having weathered) their long shipping storm.

At this point let me qualify myself as an authority, or even an expert, in the handling of QSL cards.

The figures at the head of the article show the number of cards handled in the 16 years that I have been manager of the second district, and before it slips my mind, it should be pointed out that each card, in the process of alphabetical arrangement and forwarding, is handled at least five times, and in about 25% of the cases, seven or eight times.

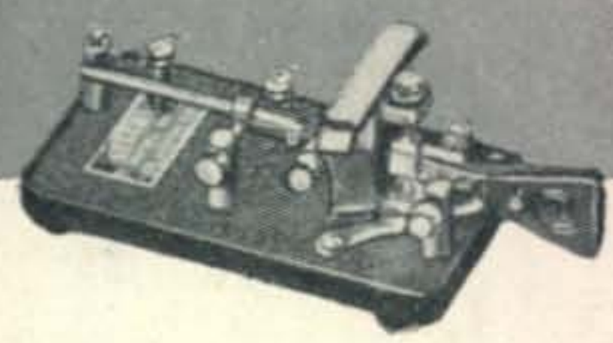
You will note in the figures listed that from 1942 to 1945 I had quite a vacation by courtesy of A. Hitler & Co., which gives me the distinction of being the only fellow for whom he ever did anything good.

Averaging Averages

So, let's get on with the averages. It goes like this—you make 50 foreign contacts, you send out 50 cards, you get back 25 cards—so your average is 50%. You put two and two together and right off you assume that 25 of the hams are gentlemen and the other 25 are NG. You're wrong! You should see some of the packages that arrive here from foreign agencies in a "busted" condition, wrapped with the well-known U. S. Postal twine, by courtesy of some kind hearted postman who has never suffered from BCI. The package had the original wrapper loosely fastened about it so that it takes no expert on deduction to figure that about ten per cent of the cards are easily missing. Perhaps some of the fellows that you averaged NG had your cherished card in the missing lot. See what I mean?

This QSL manager always had the bad habit of wetting his thumb with his tongue, to facilitate matters in sliding the top cards off the heap in the process of alphabetically arranging them—that is, until the time a shipment of cards became scattered in the same mail bag that also contained a shipment

*Second District QSL Mgr., Lake Ave., Helmetta, N. J.



Send for Your NEW ALLIED CATALOG *Today!*

YOU'LL FIND ALL THE NEW GEAR IN THIS NEW ALLIED CATALOG—GET IT TODAY

Immediate Delivery on Latest Receivers!

Hallicrafters S-51....	$129.50	National NC-57.....	$ 89.50
Hallicrafters S-53....	79.50	National NC-173.....	189.50
Hallicrafters SX-43...	169.50	National NC-183.....	269.00
Hallicrafters SX-42...	275.00	National HRO-7.....	311.36

Net FOB Chicago. Prices subject to change without notice.

NEW! Liberal Time Payment Plan

Buy on ALLIED'S new Easy Payment Plan that saves you money! Full refund of carrying charges if you complete payment in 60 days—50% refund on payment in half the required time. Minimum order is only $45.00—take up to 12 months to pay. Carrying charges are only 6% of balance after 20% down payment. Get the equipment you want this easy, economical way. No red tape—no delay—you save on ALLIED'S Easy Payment Plan.

Depend on the Leading Amateur Buying Guide

Just name your needs! You can depend on ALLIED'S great new catalog, the leading Amateur Buying Guide, to bring you *everything* that's newest and best in Ham radio. Here are complete selections of quality receivers, transmitters, instruments, parts and station gear—all at money-saving prices.

Take advantage of our new Time Payment Plan—nothing like it in radio. Get the benefits of our liberal trade-in allowances, 15-day trial on all receivers, full 90-day guarantee, and all the help in the world from ALLIED'S old-time Hams. Follow the lead of thousands of Amateurs who depend on ALLIED for all their station needs. Write today for your FREE copy of the new 172-page ALLIED Catalog, the world's Leading Amateur Radio Buying Guide.

It Pays to be "Equipped by ALLIED"

THE *ALLIED* HAM BULLETIN

Looking for new dope and really *useful* "buys"? You'll want to be on the mailing list for our lively Ham Bulletin. It's free—ask for it.

ALLIED RADIO

Everything for the Ham

Keep This Buying Guide Handy . . .

FREE

ALLIED RADIO CORP., D. L. Warner, W9IBC
833 W. Jackson Blvd., Dept. 55-D-8
Chicago 7, Illinois

☐ Send FREE New ALLIED Catalog
☐ Enter order for .....
☐ Enclosed $..... ☐ Full Payment ☐ Part Payment (Balance C. O. D.)
☐ Put my name on mailing list for the Allied Ham Bulletin.

Name.....

Address.....

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

of loose quinine . . . the most bitter bunch of QSL cards I ever tasted, and from there on out I used the wet sponge system.

All this has little or nothing to do with the cards I so sadly gazed on in my wastebasket, mentioned earlier. They are the result of pure carelessness, and after 16 years it has finally dawned upon me that it is not *my* headache to try to decipher the calls on them. I'll be more specific, and let it be a lesson to all DX men because when you previously figured that 50% of those averaged hams were NG, did it dawn upon you that you, yes you, might be in the un-cipherable catagory.

Yes, sir, now it finally comes out that those cards in the basket are there because I am unable to make out who they are intended for, and here are some of the reasons.

Parker Penmanship

Some fellows are careless with the letter M and instead of pointing down the middle section, drag it almost straight across giving it the appearance of the letter H. I have trouble with the script letter B which sometimes looks like the script letter C. You may find this hard to believe but it is true.

There is not too much trouble with the letter D, except that some of the gang do not bring the left side straight down; instead, curve it slightly, making it appear an O.

The E, F, G, H, I and J also give trouble as many of the foreign boys and gals have their own peculiar way of making them. Q seems to be the daily headache and I have found them made six ways, obviously five of which are wrong. The R, S and T give a bit of trouble, but the U and V from all countries, including these United States, take the top honors. This is one of the things that gets my goat because its pure cussed carelessness. The fellows do not point the bottom of the V, so it goes down and around and comes up U.

This could be disastrous to a fellow with a call like W2VY, who, let's say, is pacing the floor like an expectant daddy, just waiting for that rare card from Utopia, and which yours truly puts in the envelope of W2UY, thereby immediately losing two friends and 3 cents postage. VY is angry with me because he didn't get his card. UY is unhappy because the date and time does not check with his log, and, in fact, he played pool all that day. Me? I get a black mark from St. Peter because I made two people unhappy, plus a reflection on my alleged type of QSL forwarding service.

Then, there's the fellow who worked a ham and didn't quite make out his call. It was either W2PEO, W2OEP or perhaps W2EPO. "Oh well, let's send a

More Watts Per Dollar

JIM NOLAND WØAWX Omaha, Nebr.

Superintendent Electronic Radio Television Institute "We have here at the school selected both the Globe King and the Globe Trotter because after very critical inspection we decided that these two transmitters were the best for the money anywhere. Since the installation of this equipment hundreds of our students have been keenly impressed with the construction, appearance and D.X. contacts made.

WRL 275 Watt

This new WRL 275 Watt GLOBE KING Transmitter kit is available as a complete unit, or individual sections may be purchased separately—Write for prices. Complete with tubes, meters, cabinet, one set of coils.

Kit Form **$366.45**

Wired **$386.45**

QUICK DELIVERY
It takes about a week to wire this kit

UNCONDITIONALLY GUARANTEED
The WRL-275 watt "Globe King" is a versatile advanced design transmitter kit which will give you efficient performance on 6, 10, 20, 40, and 80 meter band on phone and CW. COMPARE THESE FEATURES AND TAKE ANOTHER LOOK AT THE PRICE. Front panel control of link to final input—automatic fixed bias for good regulation—voltage controlled buffer and oscillator stages—provisions for ECO—new speech modulator circuit—modulates up to 350 watts—dual power supply for oscillator buffer and RF stage—most compact transmitter on the market—stands 28¼" high **Write for complete detailed description and trade-in price on your present equipment.**

IT'S A SWEETHEART

Horace M. Whittlesey, Balderas Num. 32-217, Mexico, D. F. writes: "I have been testing the GLOBE TROTTER and had the transmitter on the air for a week and have contacted New Zealand, Australia, Peru, Venezuela, Canada, all U. S. districts, and a mobile marine in Venezuela. We contacted Hawaii also all to the credit of the Globe Trotter on 10 meter band,

WRL Globe Trotter XMTR Kit

Amateurs the world over are praising the performance of this high quality, low cost rig. It's a 40 watt input kit including all parts, power supply, chassis, panel and streamlined cabinet. Write for export prices.
Cat. No. 70-300 less tubes.....**$69.95**
Cat. No. 70-312 same as above, wired..**$79.50**
1 set of coils, meters, tubes, extra.....**$17.49**

WRL Exciter Kit

From our own labs. Uses 6L6 regenerative Osc. into an 807 driver or final. Similar to unit described in A.R.R.L. Handbook. Output 35 to 40 watts. Comes mounted on standard relay rack panel 3½"x19".
Cat. No. 70-302 less accessories.....**$19.95**
Cat. No. 70-310 same as above, wired..**$25.95**
Set of coils, meter tubes.....extra, **$10.78**
Power Supply wired with tubes.....**$22.75**

Leo I Meyerson WØEFQ

VALUES, LARGE STOCKS, FAST, DEPENDABLE SERVICE.

Hams all over the world are enjoying our personal service, fast delivery, liberal trade-ins and easy payment plan. We make it easy for you to buy and easy for you to pay. Just write and tell us what you want, the make and models you now have and I will answer your inquiry the same day giving you trade in allowances. Many times it will serve as a down payment on new gear. Dollar for Dollar you will get more at WRL. We carry a large stock of all national merchandise such as **Hallicrafter, National, Hammarlund, RME, Millen, Sonar,** receivers, transmitters, test equipment, beams, etc. Write me for anything you want. We can fill your order quickly.

20% DOWN—MONTHLY PAYMENTS TO FIT YOUR NEEDS!
It's Easy—We Finance Our Own Paper—No Red Tape

LATEST IN HAM GEAR . . . WE HAVE IT

ST202 STANCOR XMITTER KIT	$ 90.85	National NC 173	$189.50
Wired by our engineers	119.95	National NC 183	269.00
Hallicrafter HT18	110.00	Bud VFO 21	52.50
Hallicrafter HT17	49.50	Meissner Signal Shifter	99.50
Hallicrafter S 38	47.50	Gonset 6-15 Converter	75.00
Hallicrafter S 53	79.50	Gonset 10-11 meter "	39.95
Hallicrafter SX 43	169.50	Harvey Wells TBS-50	99.50
RME VHF 152A	86.50	Sonar MB 611	72.45
RME H.F. 10-20	77.00	Sonar VFX-680	87.45
National NC 33	65.95	Sonar's New CFC	59.75
National NC 57	89.50	Hammarland HQ 129X	177.30
		Millen 90810 H. F. Xmtr.	69.75

SAVINGS

LOTS OF BARGAINS TOO - - -

BC458A VFO XMTR 274N series. Ideal for 40 meters—quadruples to 11 & 10-calibrated 5.3 to 7—actually tunes 7.5 mc. BRAND NEW, original carton, complete with tubes & conversion instructions **$5.95**
BC456A modulator for all 274N XMTRS. Brand new with 3 tubes, less dynamotor, your cost **$3.95**

RADIO REFERENCE MAP

ONLY **25c**

Just right for your control room wall. Size 28" x 42". Contains worldwide short wave broadcast station, world radio amateur prefixes, United States amateur zones, time zones, monitoring stations, etc.

GET THIS 68 PAGE BARGAIN CATALOG

World Radio Laboratories
744 West Broadway
Council Bluffs, Iowa

- ☐ Send latest free flyer with bargains
- ☐ Enclosed is 25c for radio reference map
- ☐ Send more data on "Globe King" Kit
- ☐ Send more data on Globe Trotter Kit
- ☐ Send more data on WRL Exciter Kit

Name .....Call letters.....
Address .....
City..... Zone.... State.....

World Radio LABORATORIES INCORPORATED
EVERYTHING IN RADIO
COUNCIL BLUFFS, IOWA

card to all three," sez he with pride. "I'll get the right one, and mebbe two, three cards back instead of one." This is a fact and I have had on display here four sets of these monstrosities, same dates, same times, same frequencies, same remarks. Used to show them to visitors as an object lesson, and to their amusement.

To Be, or Not To Be

Another type, on which I may yet someday commit mayhem, is the one who puts W2IOP on one side of the card and W3IOP on the other.

I take great pride in the formula I have worked out for this over a period of years. It took considerable time and effort as well as an extensive study of the works of Shakespeare. I look the card straight in the eye and say softly, Eenie, Meenie, Miney, Mo, Larry needs one more country, so off you go!

Larry is happy, but Eenie, Meenie, Miney, and mainly Mo, are mad. I loose four friends and deep down inside, Larry is even a bit chagrined over the way I have treated Mo.

There are a couple of other types that I would like to get off my chest. One is the type that sits at his rig, apparently hours on end, and you know which end, working everybody and his uncle around him. He puts a penny stamp on each card along with the call letter, bundles them up, and sends them to the bureau to be addressed and mailed. His reason? No *Call Book*. More likely—no ambition. Bet the fellows often wonder why they never got cards from those boys.

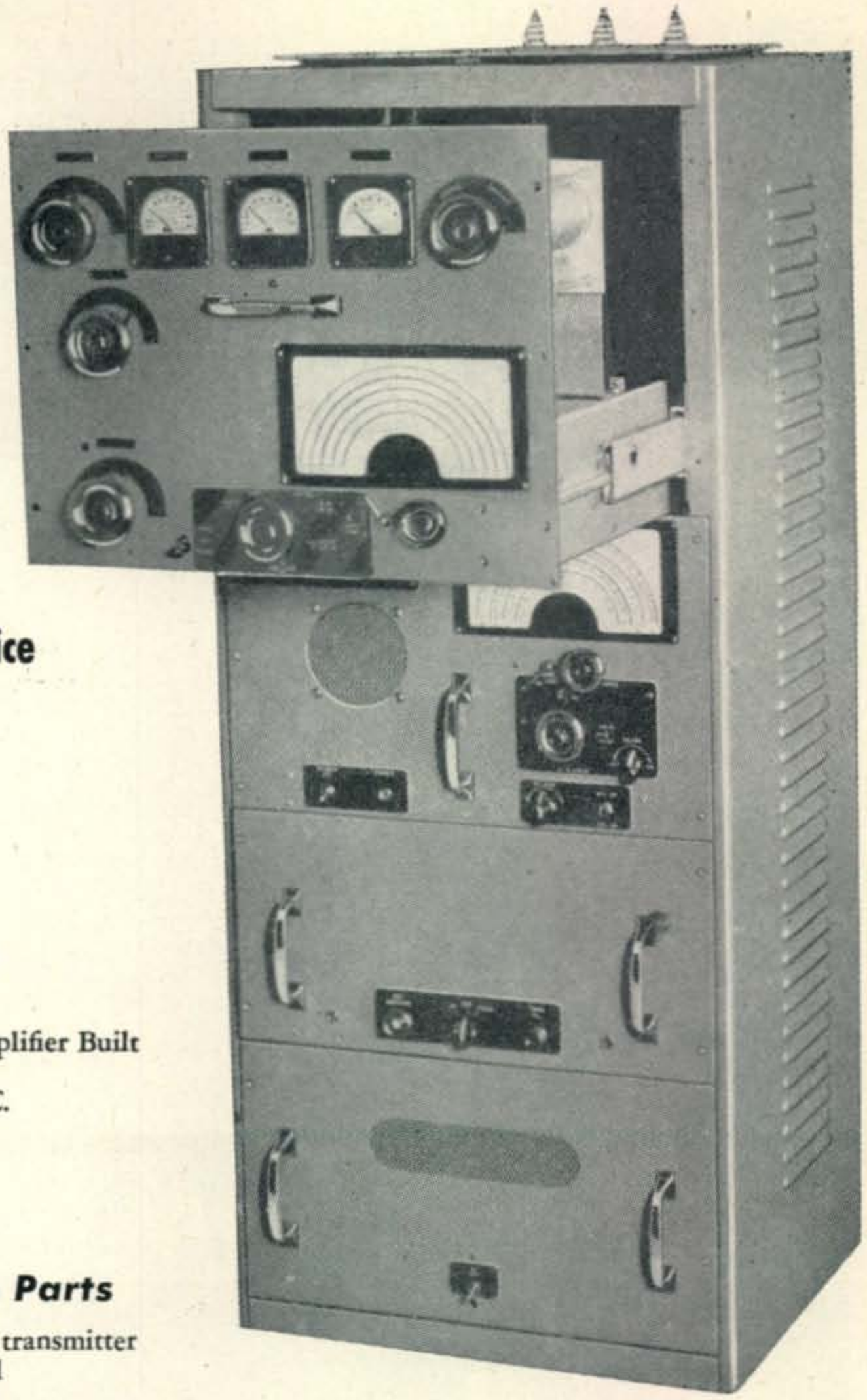
The other extreme is the polite fellow. He sends out his card through the QSL service, which is fine. He receives one later in reply, through the service. Also okay. BUT he has printed up some of the cutest little "Thank You" cards to return to the fellow through the QSL service after he has received the card. Double work times five.

There are many cards that go astray due to carelessness, rough handling and other causes, but I figure there is one language we all understand and will not misinterpret regardless of any local peculiarity in the formation of a letter. This is the language of the dots and dashes and if all DX men will take time out to insert the corresponding letters in code underneath the written call, it will be a big help in boosting the average return of cards.

So perhaps it would be well to go back over your figures this time, including yourself in the above picture. When you have written the alphabet from A to Z and checked it over carefully, perhaps, who knows, you yourself, may have misdirected a card or two. And all the while have been blaming the other fellow, who never received your card and isn't going to QSL until he does. That 296,179 is quite a figure, isn't it!

A Complete Station!

Model AN/FRC-1



300 Watt Transmitter

9 TUBE SUPERHETERODYNE RECEIVER

• Amateurs • Airports
• Ship-Shore • Police • Gov't Service

Phone, CW and MCW
Band-Spread Receiver with Built-in Speaker
Complete Station — Nothing Else to Buy
Push-to-talk Relay System
CW Break-in Operation
E.C.O. With Frequency Meter Accuracy
Receiver Range 1.48 mc. to 12.5 mc. (4 Bands)
Transmitter Range 1.49 mc. to 12.5 mc. (5 Bands)
All Important Circuits Metered
Final: 1-813 Modulator: 2-811's Class B
Power Supply, Modulator, Receiver and Power Amplifier Built in Separate Roll-Out Decks
Operates on 90 to 120 V.A.C. or 200 to 230 V.A.C.
No Modification Necessary — Ready to Operate
Universal Antenna Matching Network
Cabinet Size: 52⅛" X 21½" X 17¾"

Remote Control Unit and Spare Parts

Remote Phone or CW Operation up to 70 feet from transmitter
Unit Contains 5" PM Speaker and Volume Control
Remote Unit Has Primary Power ON-OFF Switch
Spares include 30 tubes (complete replacement) capacitors, resistors, relays, fuses, etc.

Model AN/FRC-1 Transmitter-Receiver, Complete with Speedex Key and push-to-talk microphone, ready to operate—only $495.00.

Remote Control Unit and Spare Parts and Tubes—only $39.00.

Shipped in original crates (3). All units brand new and guaranteed. Weight 800 lbs. Prices are F.O.B., Chicago. $100 with order required on C.O.D. shipments.

Write for Special Listing AN/FRC-1 for Complete Details

Standard Make Type 826 —60 Watt UHF Transmitting Tubes at 49c each! The growing popularity of the higher frequency bands makes this general purpose tube an outstanding value. These 826's are brand new, inspected, and in their original cartons. Shipped only in boxes of 8 tubes at $3.92. (Add 50c for mailing anywhere in U.S.) Ceramic Tube Sockets for 826, 829B—50c each.

WELLS SALES, INC.

320 N. LA SALLE ST., DEPT. C-4 CHICAGO 10, ILL.

DX

(*from page 54*)

rag-chewing to DXing. In fact, he squeezed every one of his 17 watts into his folded dipole and worked a VK. Hooray!

W2AQK has some very interesting dope on the Ethiopian situation. We, at one time, published *ET4Z* as the QSL manager for Ethiopia, but *ET3AF* states that to the best of his knowledge, there is no such station; and after checking with the post office at Addis Ababa, he found this QTH to be definitely in error. *ET3AF* said he would be willing to act as QSL manager for all ET3 stations, and his address is P. O. Box 858, Addis Ababa. He also states that the calls *ET3AA*, through *ET3AH*, are genuine and more or less active, and that *ET3AD*, *ET3AE*, and *ET3AF* are all quite active on 20 meters.

1948 DX Marathon

C.W. — Phone

W6ITA	38	106
W6SN	38	102
W6PFD	38	97
W5ASG	37	106
WØGKS	37	63
CE3AG	34	62
W1JYH	30	61
W6PQT	29	55
W6NNV	29	54
W1NMP	27	63
W8GLK	24	72
VO6EP	24	49
W1BFT	24	49
W6ZZ	24	37
W9VW	24	35
W2PUD	23	40
W8LFE	23	38
W6AM	22	24
KP4KD	21	48
W8NK	19	21
W8JM	18	34
W6WKU	18	23
W9CIA	17	51
W6LRU	15	16
W4HA	11	38
W2PQJ	11	17
W7PK	10	10
W4CY	6	5

Phone Only

W6DI	33	89
W1ATE	32	67
XE1AC	27	55
W5ASG	26	43
W1FJN	25	58
G3DO	25	50
W7HTB	23	46
W1EQ	22	43
W4ESP	13	21
W4HA	11	34

W3ENW has been working his share of the stuff including *RV2* and *WØOZW/KS6*, and *YA2AB*. W3EVW wants some guy to advise him how to get a card out of *VQ8AB*.

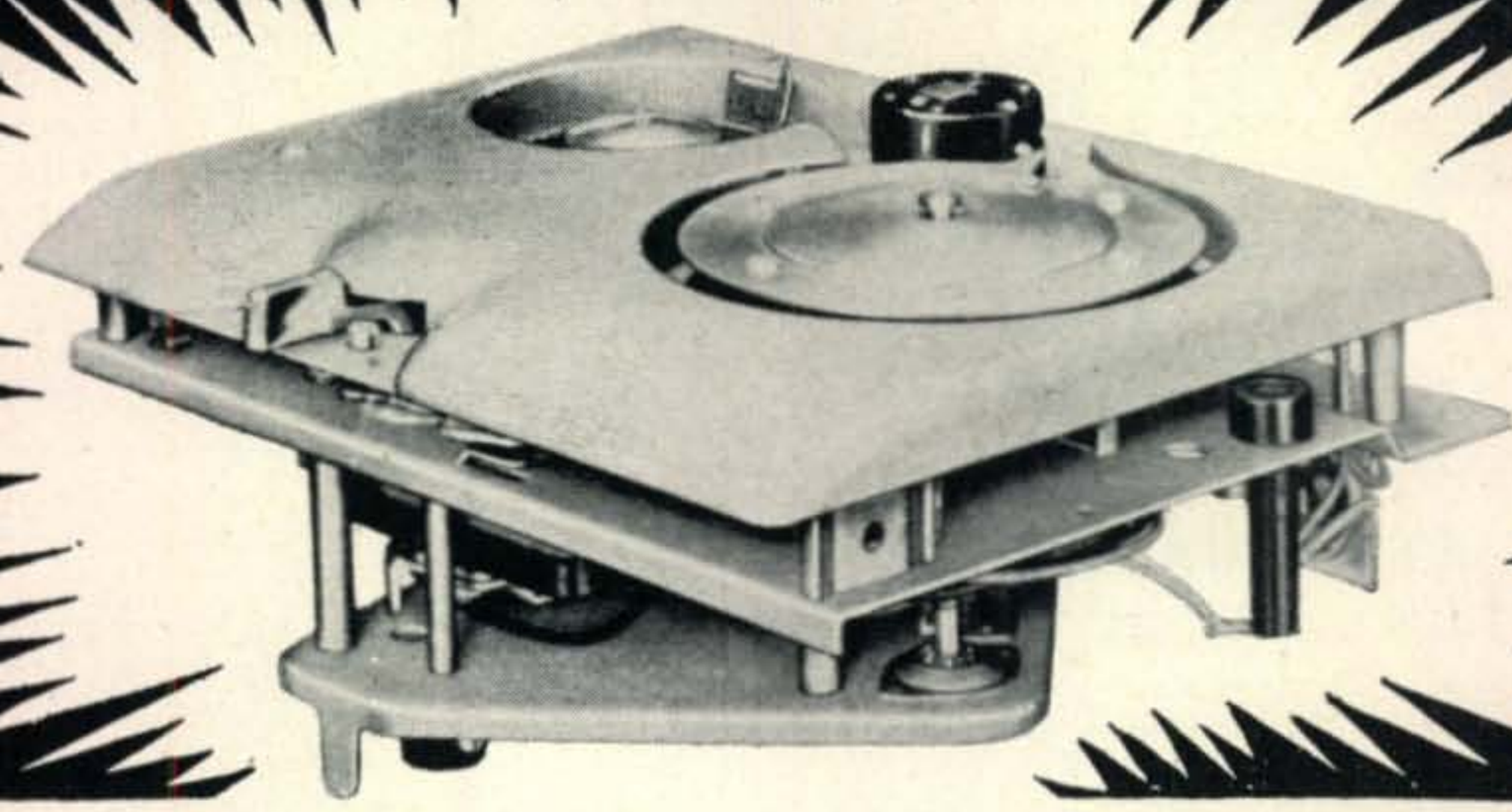
Zone and Country Log Forms Ready

If you haven't received a copy or two of the new CQ DX Zone and Country log forms, they can be had for the asking. Both forms are 8½" x 11", printed on a good grade of paper which will take ink very well. The Zone form is printed on one side of a sheet of paper, while the Country form comes in four pages, all with the appropriate column headings. You can send for a couple of forms, one to be sent in to us, and the other for your own records to keep in the shack. These forms will not only help you compile your Zone and Country Lists, which to say the least has been quite a job in the past, but it will also standardize the size for the DX committee, which, in turn, will be a great deal of help. Please send a stamped self-addressed envelope.

Speaking of these log forms, all of you who are in the Honor Roll should have received two copies of each, that is if Larry's secretary hasn't fallen flat on her face in looking up all of your QTHs. The purpose of our giving you these forms is to have you, as a member of the Honor Roll, send us nice, new, pretty lists of all your zones and countries, which, as we said before, will standardize in size, shape, and appearance our complete master file. Catch??? When you have all these new lists in shape, you can send them direct to my office in Los Angeles. Who knows, if you are good little DX men and do this, we may give you credit for the 41st zone!!!

W6NNV is a newcomer to the Honor Roll, as well as participating in the Marathon. He has taken a long time to compile his Zone and Country Lists,

HARVEY FOR HAM NEEDS . .



WEBSTER MODEL 79 WIRE RECORDER, chassis only, for building your own portable or permanently installed wire recorder. Extremely useful for recording QSO's, transmitting telephone conversations, checking your signal speech quality, etc. 15 minute spool of wire included. Hook to your own amplifier....**$44.10**

Recording wire, 15 min. $2.00; 30 min. $3.00; 1 hour $5.00 per spool.

BRUSH TAPE RECORDING chassis BK-407. Same unit as used in Brush SoundMirror. Complete with built-in pre-amplifiers, erase oscillator, tubes, etc., all that is needed to make this a complete tape recording unit is power supply (furnishing 250 volts at approx. 60 mils and 6.3 volts at approx. 2 amps.), speaker and power amplifier to drive speaker. **Net ...$131.25**

HARVEY'S HITS OF THE MONTH

Harvey has 20 meter crystals for a buck! Mounted in holder with ½" pin spacing. Also 40 and 80 meter and 6 and 13 mc. bands at the same low price.....$1.00
Special 8 mc. xtals for 2 meter xtal control, only.....$1.50
Also in stock complete line of Bliley AX-2 xtals. Include 10¢ postage with your crystal order.

HARVEY'S HAMFESTIVAL OF VALUES

Type 1616 tube; Half wave, high vacuum rectifier. Filament 2.5 volts, 5 amps; peak inverse 5500 volts; peak current .8 amps; surge current 2.5 amps; average plate current .130 amps. **List price $7.50, Harvey special price, *while they last*.....95c**
Still A Few Left!

Hammarlund FS-135-C Frequency Standard. Makes your receiver an accurate frequency standard with marker signals every 100 kc. Includes low-drift, silver plated 100 kc. crystal, 6AU6G tube, complete instructions for hook-up. Can be adjusted to zero beat with WWV. **Brand New.....$6.95**
Order a spare ***6AU6G tube*** with your F-135-C at **65c**
Brand New ***717A tubes,*** octal base 6AK5, excellent for RF stages of BC-1068A receiver and many communications receivers. Minimum order of 6.
Net price.....6 for $2.94

Thordarson 75C49 chokes, 8 H at 120 mils....**79c**

Cornell-Dubilier TJ20040 filter condenser, rated 4 mfd. at 2000 volts DC working.....**$3.75**

RCA Sound Powered Phones, Navy type, self-contained, work up to 2000 feet without batteries. Many uses around transmitter, home, plant or farm. Brand New, in original cartons. **Each.....$15.00**
per pair.....$24.50

Harvey has a very complete line of all makes and types of ***TV components, tubes and kits*** in stock such as RCA coils and transformers, Transvision kits, Vision Assembly kits, Telectron coils and transformers, Mallory inducto tuners, RCA front ends, Essex RF power supply coils and others too numerous to mention. Immediate delivery from stock. Send your order in for same day shipment.

In stock, the new **Spencer recording wire,** can be used with Webster wire recorders, etc. **15 min. $1.60; 30 min. $2.40; 1 hour $4.00**

Telephone: LOngacre 3-1800

NOTE: All prices are Net, F. O. B. NYC and are subject to change without notice.

hrc HARVEY RADIO COMPANY INC.
103 West 43rd St., New York 18, N. Y.

Get Your Order In Early For Immediate Delivery.

but steps in with the gang at 39Z and 133C. He is now running a kilowatt to a pair of 100THs, and he says the percentage of increase in contacts vs. calls is very noticeable over the results with his former low power. The antennas are two Twin Triplex, but he is now getting ready to plop his "Super r-f Squirter" on top of his 50-foot tower. If any of you fellows have been hearing WØDU, he is none other than ex-WØVEE, W9VEE, W8DU, W9GKI and 9AYX. That's enough to fill a log book. Anyway, he said, when he was signing WØVEE, so many of the boys in coming back to him dropped one "E," that he applied for WØDU, and the F.C.C. apparently obliged. His rig winds up with a pair of 8005s, the input running from 350 to 500 watts. The receiver is an HQ129X.

W4MZ is slowly but surely getting up there, his latest being *UA1KEC*. I hope Doc isn't transferred out of this location before he makes a respectable total in the Honor Roll. Come to think about it, he could be another member of this "Carpet Baggers" W.A.Z.

W3DPA passes along word that new licenses are being issued to SP hams with a power limitation of 75 watts. He says there is at least one on phone, at present, at 28,275 kc.

According to the Rochester DX Association paper, they are having a DX fest on June 21, so you fellows living in that neck of the woods better mark this date on your calendar. You can probably see who'll out-brag who. Still further in their bulletin, I see where W2SYV is leading the members with 38Z and 109C, closely followed by W2QCP with 37Z and 127C. In the phone section, W2PTX is their highest member with 35Z and 108C.

The San Antonio Radio Club bulletin, "Gutter Dope," shows their three leading DX men to be W5BE with 39Z and 134C, W5LVD with 38Z and 123C, and W5FNA with 37Z and 146C. (By the way, where are your Zone and Country Lists?) Some of the latest at W5LVD's are *HA1KK*, *ZC6RS*, *VU2SJ*, *CR6AI*, *AR3GH*, and *EP1AL*. 5LVD expects to get his 304TL fired up pretty soon.

W8RDZ had a pretty good session on 40, recently, when he worked *HB9CX*, *ZS1M*, *ZC6SM*, *PY7WI*, *ZL1BY*, and *HH2LR*. W4JEP worked *OK1VA* who passed along the dope that all OK phone stations on 10 will be above 29 mc.

W2MEL is a new one with us with 39Z and 139C. He is running 350 to 500 watts to a pair of 8005s; receiver is a souped up SX17, while the antennas consist of a full-wave for East and West, and a two-section 8JK for North and South. This is another guy who is located on the ground floor of a 40-family apartment house whose owner limits height of all antennas to 8′ off the roof. He goes on to say that with all the BC antennas on the roof also, he had a dickens of a time with BCI when using AM phone. Now when he is using phone, it is NBFM, which, apparently, has solved this part of the problem. W2MEL says that although *VQ8AK* is no longer on Mauritius, he has received a letter from him, and in case any of you fellows want to send your card, here's his QTH: G. MacKenzie Kennedy, ex-VQ8AK, c/o Standard Bank of South Africa, 10 Clement Lane, London E. C. 4, England.

KG6AL dropped in today for a while, en route to his home in Des Moines, Iowa. If any of you fellows have a card coming from him, and you want to send yours to him, he can be reached at: 1333 Boyd Street, Des Moines. Here is a guy who has worked all 40 zones from Guam, but, as yet, lacks a few QSLs.

Some of the boys have told me that the new prefix for Korea is HL. There are a couple of them on

FREE!

NEW COMPLETE *Concord* RADIO CATALOG

160 Value-Packed Pages of the Latest and Best in RADIO • TELEVISION • Electronic Equipment!

23 pgs. Radio & Television Sets • 62 pgs. Radio Parts • 18 pgs. Sound Amplifiers & Accessories • 23 pgs. Ham Gear • 9 pgs. Electronic Test Equipment

TROUBLE-FREE SERVICE from STANDARD BRAND PARTS

RCA • Amperite • Simpson-Jensen • Stancor • Ohmite • Shure • Bliley • Dumont • IRC • Triplett • Sprague • Cornell-Dubilier • Meissner... and hundreds of other brands

MAIL COUPON FOR FREE COPY

HALLICRAFTERS S-53

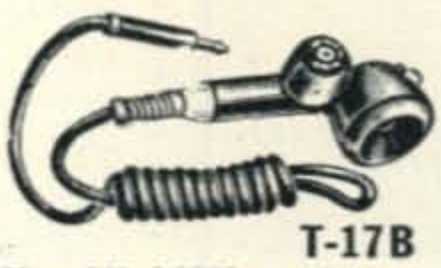
Especially designed for efficient operation with amateur rigs. Incorporates the latest engineering developments. Tuning range from 540KC to 54.5 MC. in 5 bands. Accurately calibrated slide rule dial. Built-in PM dynamic speaker. Tubes used are, 6C4, 3-6BA6, 6H6, 6SC7, 6K6GT and 5Y3GT. Beautifully styled steel cabinet finished in satin black and chrome, 12⅞ x 6⅛ x 7⅛"D. For 105-125 volt 50-60 cycle operation. Shpg. wt. 23 lbs.
C21063BD **$79.50**

ACORN TUBE SOCKET

Low loss socket with rugged spring contacts for 954 and 955 tubes. Constructed of ceramic material. **X167BD** **9c**

MILLIAMMETER

0-200 MA. 2½" flange mounting type. Calibrated for use on ⅛" steel panel. High quality workmanship throughout. Metal case dull black finish. Mounting hardware included
X175BD....
Your Cost.....**$1.95**



T-17B Hand Held Microphone

High quality, lightweight. Sturdily constructed 200 ohm single button carbon mike with hiss filter and push-to-talk switch. Complete with 5 ft. rubber cord, PL-68 plug and mike dust cover.
5B7062BD **88c**

NATIONAL NC-33

Continuous coverage from 500KC to 35MC in 4 bands. Bandspread operation at any frequency in tuning range. Built-in 5" PM speaker, automatic noise limiter and CW oscillator with pitch control. Tubes used are, 12SA7, 12H6, 12SL7, 35L6 and 35Z5. Cabinet is finished in smooth gray enamel. For 115 volt AC-DC.
C21267BD **$65.95**

XMITTER TUNING UNIT

TU-10-B plug-in type variable frequency master oscillator tuning unit. Frequency range 10,000 to 12,500KC. Ideal as basic unit for high power transmitter exciter unit. Size: 7⅝ x 16¾ x 8¾".
5B9542BD **$1.95**

Order Today—Satisfaction Guaranteed or Money Refunded

MAIL COUPON NOW!

CONCORD
RADIO CORPORATION

CHICAGO 7
901 W. Jackson Blvd.

ATLANTA 3
265 Peachtree St.

Downtown Chicago Branch: 229 W. Madison

Lafayette Radio Corp.

Concord Radio Corporation, Dept. 154
901 W. Jackson Blvd., Chicago 7, Ill.

Yes, rush FREE COPY of the comprehensive new Concord Radio Catalog. (Please print)

Name.....

Address.....

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

phone; *HL1AC* and *HL1BB*. By the way, W6VFR, who tops the Honor Roll with 189 countries, had a phone QSO with *J3GNX*. J3GNX told him he had recently worked *AC4YN* who also was on phone. Have patience, fellows, maybe Reg Fox will get steamed up again on both c.w. and phone.

W6PCS, who, by the way, is up to 39Z and 164C, sent through a bit of encouraging news for some of you, I am sure. He has received a home-made QSL card from XU4B, who is not only also in Zone 23, but was also located in Mongolia. I don't know how many QSO's XU4B had, probably very few, but for those of you who did work him, there is still hope. I think, possibly, he is back in the States, and as soon as we can pin down his QTH, we'll let you know.

VK2DI is a new one with us and goes in the Honor Roll with 39Z and 150C. Although he has worked all zones, he is still waiting for cards from 17, 18, and 19. As *VK2DI* put it, "Thanks for a little push from VK2ACX, and the boss's secretary, I am finally getting around to this W.A.Z. business." Of course, what he means is typing up the country list. Once again, the new Zone and Country log forms, which we have printed, will save you fellows a lot of time, if you will just write in and ask for a couple of copies.

VE7HC passes along a little dope about *LB1OA*, just in case any of you fellows have heard or worked him. Anyway, it is the Norwegian Whaling factory's SUDEROEY, operated by LA1OA, who was near 66° South, and 33° East. QSL via LA1OA. Yep, you're right, if it is a boat, it doesn't count as a country. VK2ACX is now up to 39Z and 133C, having knocked off *UI8AD*, *UJ8AD*, *MB9AS*, and *UA1KED*. He said he heard VK2EO now has 40Z and 134C, and VK2QL, another old-timer, has 39Z and 114C. (These fellows better borrow the same secretary used by VK2DI and get their lists in.)

In a letter received the other day from ZS2X who as you may remember was the first to W.A.Z. out of the States, we learn that *ZD6DT* has closed down and moved to Rhodesia. Likewise, *ZS6OL* of Bechuanaland has now returned to England. *ZS4P* of Basutoland now has his son interested in the game, and he has just received his call *ZS4BW*. For a while, he'll probably stick to 7 mc, however. Probably the most important news in the letter from ZS2X is that they are trying to get one of the operators at a commercial station on Tristan da Cunha interested in coming on the air, and, at the time of writing the letter, one of the ops on leave in ZS is getting the necessary gear to build a rig. Rex says it will probably be early summer before he returns to Tristan da Cunha. That's one worth waiting for. There are several more VQ8s on, although not too active; *VQ8AE VQ8AY*, and *VQ8AZ*. He also says *ZS3D* and *ZS3G* are now mostly on phone. There are some changes in the ZS districts appearing in the new country list thanks to ZS2X.

OK1AW, one of the real old-timers over there, is still after them, but as Alois says, "I am not yet able to tell you that I have worked Zone 23." He does tell me that he has picked up *VP5FR*, *AR1YL*, *UL7BS*, and *VS9AR*. OK1AW must have been inspired by seeing the picture of I1MQ, a YL, in December *CQ*, because the very next day he had a nice QSO. As he said, "Ada promised to send me her picture soon. Her keying is very FB."

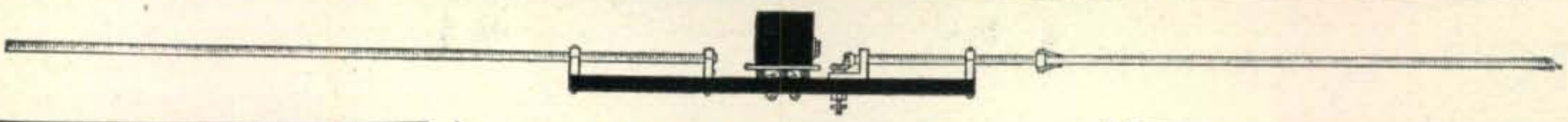
Bill Shuler, W7BE, is putting his W7 call on the map by leaps and bounds. A few of his latest include: *KH6LX/VR1*, *VQ4EHG*, *MD7A*, *UO5AC*, and *WØOZW/KS6*.

PY1DH says it is absolutely true that he does not keep ice on his antenna. This is borne out by the

MORE FOR YOUR MONEY WITH THESE DOLLAR-STRETCHING VALUES

"Communications"

MANUFACTURERS' QUANTITIES ON HAND. QUOTATIONS ON REQUEST.



TRANSFORMERS
(All primaries 110–117 V, 60 cycles)

Power Pair: 2 xfmrs to deliver 980–0–980 volts @ 450 ma. Per pair **$9.95**

Power Pair: xfmr 470 v.c.t. @ 60 ma. 6.3 v. @ 1.65, 5v. @ 2 amp. PLUS a 6hy 50 ma. choke. Both for only **$1.75**

FILAMENT TRANSFORMERS

5058: sec # 1: 6.3 V @ 2 A CT sec # 2: 6.3V @ 2 A CT **$2.15**

5126: 5 V @ 3 A CT, 5 V @ 3 A CT, 5 V @ 6 A CT **$2.25**

5100: 6.3 V CT @ 1.2 A, 5000 volt test **$1.35**

5085: 6.3 V NCT @ .6 A, 6.3 V NCT @ 1.5 A **$1.40**

5057: 6.3 VCT, @ 1 A, 5 VCT @ 3 A, 5 VCT @ 9 A **$2.15**

UX 6899: 5 V @ 5.5 A, 5 V @ 5.5 A. 29,000 V test **$24.50**

Doughnut fil. xfmr: Input: 117 V, 60 cy. Output: 2-5.1 V. wdgs @ 5 Amp. 15,000 volt insulation. Electrostatic shielding. 7" x 5" x 7½". Amertran **$7.50**

5123: 6.3 VCT @ 5 A., 6.3 VCT @ 1 A. **$2.15**

5109: 27 V. @ 8.8 A., 6.3 V. @ 2.5 A. **$2.75**

CHOKES

6 Hy @ 150 Ma **$1.50**
6 Hy @ 300 Ma **$3.25**
1 Hy @ 800 Ma. 7.5 ohms **$8.95**
Dual choke, 2 Hy @ 100 ma. . **$ .90**
Dual choke, 7 Hy @ 75 ma, 11 Hy @ 60 Ma **$1.50**
8.5 h. @ 125 Ma **$1.50**
25 h. @ 65 Ma **$1.10**

HEADSETS

P-20 Headsets. 10,000 ohm impedance. Similar to Trimm $7045. With 8' cord and PL 55 plug, **$2.25.**

Dynamic mike and headset combination. A high quality, efficient unit, used in B-19 tank Xmtrs. Mike & phones complete, new as shown **$2.75**

HS 30 HEADSET: A featherweight headset with insert type phones that cut background noises to a minimum. Low impedance (500 ohms) assures efficiency & high fidelity. ..... **$.85**

Matching transformer to match 500 ohms to 8000 ohms output. . . . . **$.35**

R-15 headsets: 8000 ohms impedance, rubber cushions. Comes with 8' cord & plug PL 55. New . . . **$1.95**

Used, in good condition ..... **$.60**

VIBRATOR TRANSFORMER

Input: 24 v, 12 v, or 6 v. Output: Two 120 v. windings @ 175 amp. Plus 11 v winding. Ea. **$1.50**

ANTENNA AN/122-A. (As shown.) Used in Adcock array of 4 elements, these dipoles make efficient, lightweight beams for the 6 or 2 meter band. Each dipole element is 12' long, overall, made of 3/8" dural tubing. One side of dipole is adjustable in length by means of a bevel gear arrangement to facilitate fine tuning. Get four of them for only **$20.00**, or **$5.65 each.**

ANTENNA AN/104-A. The famous Ax-handle antenna, used with the SCR 522. Ideal for that mobile quarter wave on 2 meters. Streamline construction. Two units can be used as an efficient dipole for 2 meters or FM & TV. reception. Each unit consists of a copper sheath 21" long, molded about a sturdy wooden support with an 83-1R connector. **$.75 ea.** or **2 for $1.35.**

AN-128-A. 2 meter directive array consisting of 2 vertical dipoles working against a square reflector, approx. 4' x 3'. Surge impedance is 50 ohms. New, complete with support assembly **$40.00**

Schematic diagram ARC-5 xmtr. and rcvr. . ea. **50c**

ARC-5 ACCESSORIES

Conversion Coils for Arc-5 Transmitters

M.O. Coils $1.00 ea.	P.A. Coils $1.00 ea.	Antenna Tuning Coil $.85 ea.	Freq. Range
#6029	#7247	#6033	3–4 mc.
#6030	#9293	#6034	4–5.3 mc.
#6032	#9295	#6035	7–9.1 mc.

Kit, consisting of 1-M.O. Coil, 1-P.A. Coil, & 1-Ant. tuning coil in any one particular frequency range **$2.00**

Single, double, mounting racks for rcvrs. **$1.00; $1.50**

Shock mounts for racks ..... **$ .50**

Dual rcvr. control boxes—BC496-A **$1.00**

ARC $6030 Oscillator coil, 4-5.3 mc. For ARC 5 transmitter **$1.00**

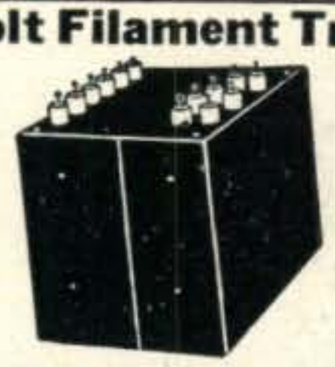
ARC $6558 variable receiving capacitor. 62 mmf/section, 3 sections. .03" spacing, 8 rotors. Worm drive ratio 33:1. ..... **$1.75**

CATHODE RAY TUBES

5BP1's . . **$1.20** **3BP1** . . **$1.25**
3FP7 . . . . **$1.20** **5FP7** . . **$1.75**
5JP2 . . . . . **$4.00**

12 and 24-Volt Filament Transformers

Input: 117 V, 60 cy. Output: 24 volts @ 3 A. (As shown) Size: 3" x 3½" x 3" each **$1.50**



Input: 110–117 V, 60 cy. Output: 12 volts @ 10 A, or 24 volts @ 5 A. . . . **$2.75**

DYNAMOTORS

PE 73 CM. Power supply for BC 375. Input: 28 VDC. Output: 1000 VDC @ 350 Ma. Starting relay, filter, etc., new **$4.95**

BD 77KM. Power supply for BC 191. Input: 14 VDC. Output 1000 VDC @ 350 Ma. with spare fuse links, etc. **5.95**

PE 101C. Input 13/26 VDC @ 12.6/6.3 A. Output: 400 VDC @ 135 Ma., 800 VDC @ 20 Ma. (9 VAC @ 1.21 A) **3.49**

PE 86 Input: 28 VDC, Output: 250 VDC @ 60 Ma. Westinghouse, with filter **3.95**

DM 28-R, Input: 28 VDC @ 1.25 A. Output: 270 VDC @ 70 ma. New, with enclosed terminal box, filter, etc. **$3.25**

ZA/USA .0515, Input: 12/24 VDC @ 4/2 A. Output: 500 VDC @ 50 ma. Compact, rectangular, 7½" x 4¼" x 3" **$3.95**

ZA/USA .0516, Input: 12/24 VDC @ 8/4 A. Output: 275 VDC @ 110 ma, 12 VDC @ 3 A. Compact, rectangular, 7½" x 4½‡‡ x 3" **$4.25**

DM 33 A, Input: 28 VDC @ 7 A. Output: 540 VDC @ 250 Ma. Power supply for modulator for SCR 274 N **3.95**

Dyn. Model 23350. Input 27 VDC @ 1.75 A. Output: 285 VDC @ 75 Ma. **1.75**

DM-21: In 14 VDC 3.3 A Out 235 VDC 90 Ma. with filter, power supply for BC312 ..... **2.59**

PE 55. Input: 12 VDC @ 25 amp. Output: 500 VDC @ 400 Ma. (slightly used, excellent condition) **4.95**

MK II power supply. Input: 12 VDC @ 9.4 Amp. Output: 275 VDC @ 110 Ma., 500 VDC @ 50 Ma. New, complete with connecting cable and plugs **4.75**

HAND GENERATOR, GN-35

Delivers 345 VDC at 100 ma, 8 VDC @ 2.5 A. Completely sealed, water-tight construction, 8" x 6¾" x 5¾". Complete with adjustable voltage regulator, less hand crank **$3.95**

OUTPUT TRANSFORMER

Western Electric KS 9496. 9,000 ohms push-pull plates to 9 ohm voice coil. Handles 250 watts. HI-FI. Freq. response: -3 db @ 50 cycles, -1.25 db @ 100 cycles, 0 db @ 1000 cycles, -.3 db @ 10,000 cycles, -3 db @ 50,000 cycles. wt.: 14½ lbs. New **$3.95**

MOTOR-DRIVEN SWITCH

Switch operates at 1800 rpm, using internal 24 VDC motor. Switch is DPDT, and was originally designed for automatic switching of YAGI radar antennae **$2.00**

Motor driven switch mounted in aluminum case, black crackle finish and 6 Amphenol 83-1R low loss connectors. Size: 5¾" x 7 x 5¾". New **$4.00**

CERAMICON CAPACITORS
(Standard Brand) $7.50 per 100

3 mmf	±5%	48 mmf	±20%	120 mmf	±5%
5 "	±5%	50 "	±20%	240 "	±3%
4 "	±.5 mmf	60 "	±3%	250 "	—
8.5 "	±5 "	67 "	±20%	500 "	±15% M30%
11 "	±5%	100 "	±5%	1000 "	±5%
15 "	±2.5 mmf	115 "	±2%		

SILVER-MICA BUTTON CAPACITORS
(Standard Brand) $9.50 per 100

185 mmf	175 mmf	500 mmf
± 2.5 mmf	±2.5 mmf	± 10%

INVERTERS

PE 206-A. Input: 28 VDC @ 38 Amp. Output: 80 volts at 500 volt-amps. 800 cycle. Leland Electric. New, complete, with enclosed relay, filter, instruction book **$12.50**

PE 218. Input: 25–28 VDC @ 92 Amp. Output: 115 volts, 1500 volt-amps, 380–500 cycle. Leland Electric. New . . . **$15.00**

A complete Line of Microwave Equipment in Stock. Write for your needs.

ALL MERCHANDISE GUARANTEED. Mail orders promptly filled.
All prices F. O. B. New York City. Send Money Order or Check. Shipping charges sent C. O. D.

COMMUNICATIONS EQUIPMENT CO.

131 - Q Liberty St., New York City 7, N. Y., DI 9–4124

Amphenol Connectors
83 IR **27c**
83 1AP (Elbow) **27c**
83 1SP **27c**

new stuff he has worked, making his total 38Z and 138C.

We're glad to see OK1CX join our happy family in the Honor Roll with 38Z and 110C. The only zones he hasn't worked are 23 and 26. He is using a T-55 in the final, with the input running between 50 and 100 watts. He also uses a v.f.o. He was originally licensed in 1934, so this makes him quite an old-timer in the game. Another one we are glad to see is *VR5PL* who shows up with 38Z and 109C. The only zones VR5PL needs are 18 and 23.

According to information passed along from KH6NB to W6UCX, the two stations on Palmyra, *KP6AA* and *KP6AB*, lost everything they owned, including their gear in a recent fire which burned their dwellings to the ground. This is certainly not the kind of news we like to register in this column, but some way, somehow, we know they will get going again very soon. As a rule, the ham fraternity has a way of helping out in things like this.

In a letter from ex-HZ1AB, it appears that very shortly he will get a CE call, as he is now acting as flight radio operator for the Peruvian International Airways in Santiago, Chile. You may recall that his stateside call letters are W4JMQ. He says QSL cards are still catching up to him for contacts made as late as November, 1947, which means that the gang are still operating HZ1AB. However, Andy goes on to say that anyone needing a card from him for a QSO *before* June 10, 1947, can write him direct, as that is the date he personally signed off. His full name is: J. P. Anderson, Jr.

W7EYS has heard *KA1CB* on 10 phone, and he was running .2 watts (2/10 watts, that is). This enormous power is on a couple of acorn tubes in the final. W7EYS is wondering if KA1CB has to step the audio up or down from his mike to the modulators.

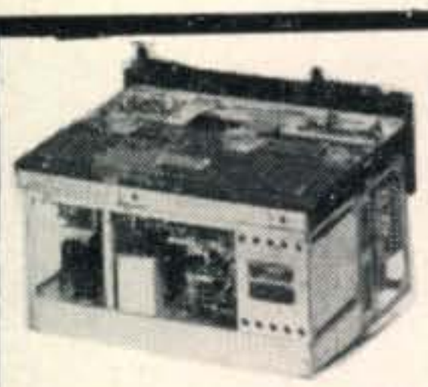
W2NXZ operates 10 phone only, with 300 watts, and insists he is going to make W.A.Z. He has just put up a new 4-element beam which should really give him a lift.

W8HGW, who is tied for second in the Honor Roll with G2PL, added *UL7BS* and *FQ3AT/FE*.

VK4RC has been keeping his ears open for *C8YR* or *AC4YN*, but, up to now, the nearest he can get is *HS1SS*. At the present time VK4RC says he has been one of the old gray beards sticking to xtal control, but he says not for long as he is converting over a TUB-6 tuning unit, and then watch his vapor trail.

In a letter from V. Vasilescu, *YR5V*, of Bucharest, Romania, we learn that the YRs are closing down while waiting for new licenses. He says they expect to get them sometime during the spring. Vasilescu uses a pair or 100-THs in the final driven by a pair of 807s. His antenna is a half wave doublet. On c.w., he runs a kilowatt input, while on phone, it's 500 watts. He is still using the same NC-101X he used prewar. DX, to date, is 123 countries worked, and he says that during the winter layoff, while all their stations are closed down, he hopes to rebuild and add some of the latest refinements, including NBFM, as well as changing his modulators in order to run the full kw. on phone. Vasilescu is a sound engineer, and, on occasions, he has made recordings of both c.w. and phone contacts with W stations. Incidentally, he is in dire need of Wyoming, Utah, Nebraska, and South Dakota. He is wondering if there are any active hams in the first two states. How about it, fellows? His QTH is: V. Vasilescu, Box 326, Bucharest, Romania.

A lot of boys want to know why MD5, Suez Canal, is not separate from Egypt SU. About the only similarity is that each is a canal. KZ5 calls



"SCR 522"

$13.75

The famous SCR 522 Radio Transmitter and Receiver, for operation on the 2 meter band (100 to 156 M.C.), is now available, complete with all 18 tubes in EXCELLENT condition at an unbelievably low price. This set is easily converted to 6 meter operation, if you prefer.

Now only $13.75

(Shipped express charges collect)

BC221 Frequency Meter

NOW ONLY $24.50

The famous BC-221 Signal Corps. Frequency Meter is now offered at an unbelievably low price of only $24.50 each. These meters cover from 125 K.C. to 20 M.C. and are accurate to approximately .01 of 1 Percent. They are used but in excellent condition complete with calibration chart, tubes and crystal.

(Shipped express, charges collect)

PHANTOM ANTENNA

85¢

A transmitting antenna, for use on approximately 450 MC. Complete with standard coax connector. A weatherproof unit. (Add 25c to cover handling and postage).

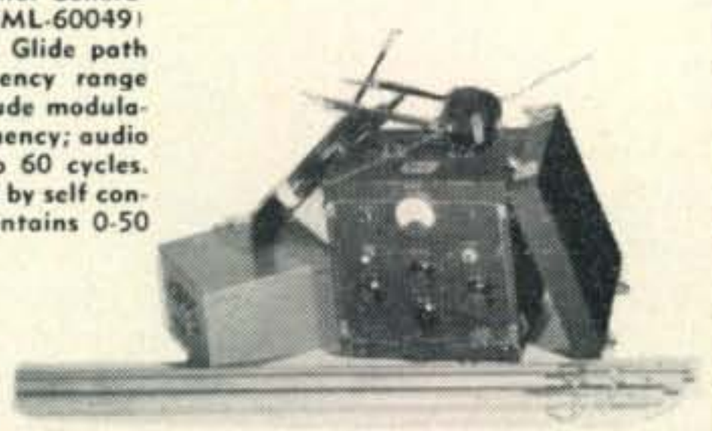
Transformers $1.50

A real transformer buy. 110 volt 60 cycle primary will give you anything from 3.5 volts to 80 volts with plenty of amperage. Will run many 24 volt aircraft motors and gadgets. Brand new guaranteed.

(Add 35c to cover Handling and Postage)

SIGNAL GENERATOR $29.50

LS-1 Squadron Signal Generator (Navy Type CML-60049) used for Type ZA Glide path equipment. Frequency range 90-95 mc. Amplitude modulated - variable frequency; audio oscillator tuned to 60 cycles. R F level measured by self contained VTUM. Contains 0-50 micro-amp meter.



1300' Ruber Covered Wire

ONLY $18.00

New 4 conductor 16 gauge rubber covered cable. Color coded. Used by United States Government as Field Telephone Cable. 1300 feet on steel reel. F.O.B. Our warehouse Shipped motor freight or express shipping charges collect.

Aircraft XMTRS.

only $3.30 each

BC-457-A, 4 to 5.3 MC and BC-458-A, 5.3 to 7 MC. These transmitters are companion sets to the 453, 4, and 5 receiver series. They are used, but in excellent condition. It's really built rugged and makes an excellent 55 watt transmitter. With tubes.

Shipped Express Collect

12 Volt 50 Amp Generators

These generators are excellent for truck or bus use. They also will make a fine power supply for your radio shack or nice light welder. Brand new in original boxes as pictured with pulley, $9.45 each or with keyed shaft less pulley - - $7.95 each.

(Shipped Express Collect)

500' Telephone Wire now only $2.95

3 conductor braided insulated copper and steel telephone wire. It is of copper for conductivity and steel for strength. Worth at least 3c per foot, yet due to an exceptional buy we can now offer it at less than 1c per foot.

(Shipped express charges collect)

Stock Up

WILLARD 2 VOLT BATTERIES

ONLY $1.25 each

Brand new. Compact, spill proof. Built-in Hydrometer. Group several together for higher voltages. Uses Standard Electrolyte. Guaranteed. Add 35c to cover postage and handling.

66" AUTO ANTENNA $1.29

A brand new heavily chrome plated side cowl antenna, originally used on 46 and 47 Hudsons. Telescopes to 66" long, fits most cars up to 1947. Originally sold for many times this price. (Add 40c to cover postage and handling.)

IMPORTANT!

All merchandise subject to prior sale, minimum order $2.00, No C.O.D. orders accepted. Michigan residents must add 3% State sales tax.

More Scoops!

B. C. 450 A. Control Box For 274 Command Receivers	$1.50
B. C. 434 F Control Box	$1.25
N. 6 A. Gun Sight	$1.00
RCA Antenna Reel (Model M-1) (19611)	$1.49

Add 25c each to cover Postage and Handling on all above items.

Meters 99¢

Brand new Bowers D.C. Volt meter 0 to 9 volts in 2" case with 2 3/4" Flange ..... each .99c

Brand new Bowers D.C. Anmeter 0 to 100 amp scales (600 ma. movement with 100 amp shunt) same case as volt meter each .99c

Add 20c each to cover postage and handling

CATHODE RAY TUBE BARGAINS

3 CP 1 (Indicator screen)	.95	5 FP 7	1.75
3 DP 1A (Indicator screen)	.95	5 CP 1	1.95
3 FP 7A	1.35	5 BP 1	2.45
3 AP 1	1.45	5 HP 1	2.45
3 HP 7	1.45	5 JP 1	2.45
3 BP 1	1.50	7 BP 7	2.65
908	1.50	7 CP 1	3.25
		9 GP 7	3.50

Add 25c to cover shipping charges on all 3" tubes, 35c on all 5" tubes, 40c on all 7" tubes, 9" tubes shipped express charges collect.

N. SILVERSTINE CO.

6532 EAST McNICHOLS ROAD DETROIT 12, MICHIGAN

"Seven Acres of Surplus"

are issued by the United States government. It has been recognized as a permanent prefix for years. MD5 calls are issued by the local British army headquarters in that area, and may be temporary. When the time arrives that it is recognized by England herself as a separate political entity, and we are so advised, it will naturally come up for consideration.

My trustworthy operative 1492 tells me that W2IOP is about ready to settle down and make up for lost time. He also tells me W2GWE hopes to pick up Zone 23 in the present DX contest.

Hooray, W6QD worked Zone 2. Yes sir, it just goes to show, if you wait long enough, you can get almost anything. For two years now, poor OM Becker never could seem to get on the air when the VO6s were coming through, but he did stumble into the shack long enough to turn on the receiver with the thought of looking for *VO6EP*. Well, he wasn't in there, but *VO6J* was, and after putting all the ummph into calling him that the banana boat swing would allow, a contact was established. Of course to all you fellows, Zone 2 is just another everyday occurrence, but to QD, it has been the jinx. Now he'll retire to the waiting room to chew his nails pending receipt of confirmations. Right along side of me is poor old W6ENV whose nails are all gone from waiting for the card from *C8YR*. Does anyone know who has Andy's C8YR card? I hope the guy receives it pretty soon, as he throws the entire DX committee into a turmoil at every session we have.

I guess that will just about do it. Anyway, it is getting late, and I think I'll see if I can snag me a nice new W9. 73.

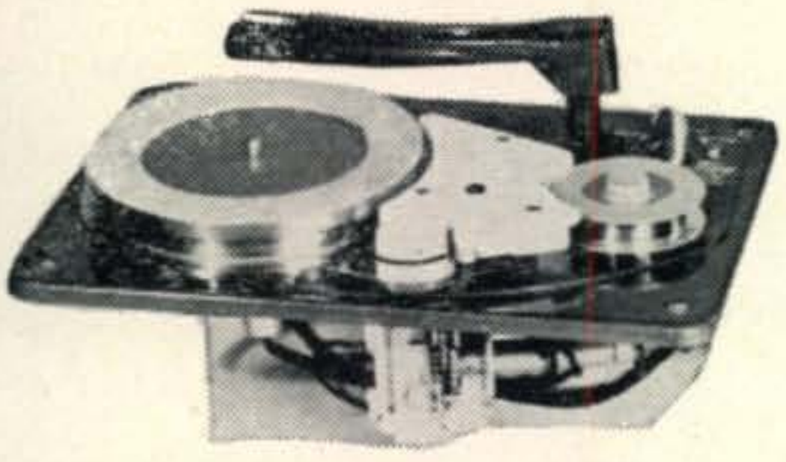
DX QTHs

C1JH, James C. Holt, 280 House 7, Wukang Road, Shanghai 18, China
C6HH, Hanson, Box 2, Hanchung, Shensi, China
C8AAJ, C.N.A.C. WX Stn., Monloo, Tibet, China
CE3EE, Micomedes Moran, Casilla 3997, Santiago, Chile
CN8BA Raymond Pierre, Le Cret, Rabat, French Morocco
CT1A, QSL via W1AZW
CT2AB, APO 406, c/o P.M. New York City
FO8AA, c/o Radio Club, Papeete
FU8AA, Rene Thevenin, Ile de Pentecote, Nouvelles Hebrides
GD3BBS, Jack Gawne, Harbor House, Porterin, Isle of Man, or via R.S.G.B.
HZ1AB, 161 A.A.C.S. Sq., 791 A.A.F.-B.U., APO 616, c/o P.M. New York
I1AHK, Aldo Ravena, via Principe Amedeo N. 8, Cagliari, Sardinia
KZ5AY, L. R. George, Box 75, Howard Field, C. A.
KH6LX/VR1, Makin Atoll, Gilbert Isle, QSL via Bureau Honolulu
MB9AG, Sgt. Milton, 3 Squadron, 8th Army Signal Regiment, Klangenfurt, British Troops, Austria
OX3GG, APO 858, c/o P.M. New York City
SU1JM, c/o T.W.A., Communications Dept., Farouk Airport, Cairo, Egypt
VP5PU, APO 845, South Caicos Isl. c/o P.M. Miami, Florida
VS4WL, Robert Wellspreng, RAF Detachment, British Borneo
WØCTV/VR1, Makin Atoll, Gilbert Isl., QSL via Bureau Honolulu
WØOZW/KS6, Wm. H. Crook, Rm 3/c, C Division, U.S. Naval Station, Tutuila, American Samoa
XAGB, Cpl. John P. McArdle, 18 Signal Sv. Co., APO 88, U.S. Army, Free State of Trieste
DA7AA, QSL via W3JAK

ECA CALLING ALL AMATEURS FOR SPECIAL BUYS

COME IN AND BROWSE IN OUR NEW DEPARTMENT

WIRE RECORDER FOUNDATION UNIT

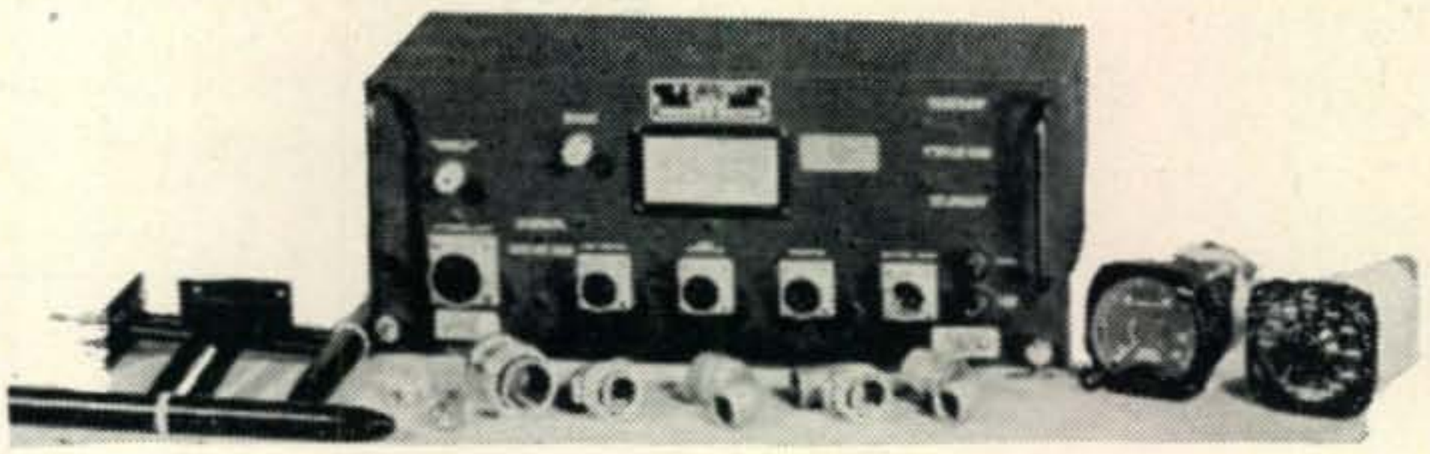


For use with your own amplifier. Excellent for recording your Q.S.O.'s. Records up to one hour. Impressions can be erased and wire reused. Also plays 10" or 12" records which can be recorded on wire. Featherweight pickup. Operates on 110 Volt, 60 cycle. Mounting plate 9" x 13" **$47.50**

MAGNETIC WIRE FOR RECORDER

15 Minute wire spool	$1.95
30 Minute wire spool	2.90
1 Hour wire spool	4.95

BRAND NEW APN/1 ALTIMETER



A complete transmitter and receiver for 418 to 462 M.C. operation which can be converted for amateur use. Tubes and other components included are: 4-12SH7, 3-12SJ7, 2-12H6, 2-955, 2-9004 and 1-VR-150; relays, dynamotors, external altitude indicator, altitude limit switch, two antennae, all plugs and coaxial connectors. Brand new, export packed **$34.50**

Lots of 6 each $29.50

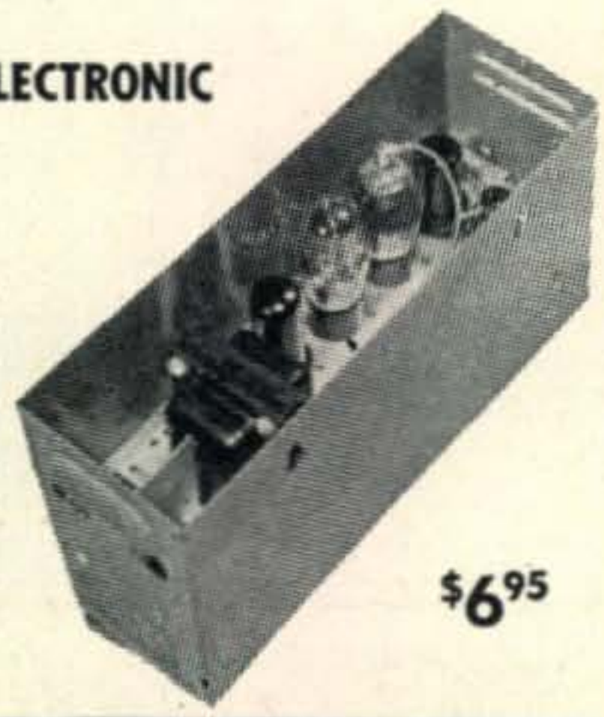
DYNAMOTOR

For transmitters or public address outfits: mobile or yacht installations. Output — 500 volts at 200 MA continuous or 400 MA intermittent. Input — 12 or 24 volts DC. Made by the Rauland Corp., type PE-135AX.

$5.95

RCA CAPACITY-OPERATED ELECTRONIC CONTROL

Employs no light source yet at the approach of any human or animal, relay is momentarily tripped. Can be used with manual or electrical reset relay to provide continuous contact after actuation. Has numerous uses as a protective device and is also ideal as a basic unit for small audio amplifier. Tubes included are 6-SQ7, 6-F8G, VR-150-30, 6X5. Full operating instructions. For use on 110 Volts, AC only.



$6.95

MILLIAMETERS

High quality units made by one of the best known meter manufacturers. Black dull finish 2½" panel mounting flange type case. Mounting hardware included.

0 — 20	M.A.D.C.	$1.85
0 — 200	M.A.D.C.	1.85

T-17 HAND MICROPHONE

A sturdy constructed single button carbon mike with press-to-talk switch. Complete with 5 foot rubber cord and PL-68 plug **85c**

MOULDED MICA TRANSMITTING CAPACITORS

MFR.	CAPACITY MFD.	W.V.D.C.
Sangamo	.00009	3000
Sangamo	.0001	3000
Spragu	.00005	3000
C.D.	.006	2500
Sangamo	.00036	5000
Sangamo	.0004	5000
Sangamo	.00056	5000
Aerovox	.0012	5000

YOUR CHOICE 49c

TUBES

954 ..... 9003 .....
955 ..... 9004 .....
YOUR CHOICE **19c**

Special!

MANUFACTURERS LIST $15.00
YOUR COST
95¢

AEROVOX OIL FILLED CONDENSER

Capacity .05 mfd., working voltage DC 7500. Excellent for transmitting or television circuits. Overall size, 5" high x 2¼" diameter.

G.E. Oil filled	.01 Mfd. 5000 W.V.D.C.	50c
C.D. Mica	.03 Mfd. 2000 W.V.D.C.	30c

FILAMENT TRANSFORMER

Hermetically sealed filament transformer 5¼" high, 4¾" wide, 3½" deep, with 10,000 volt insulation. Primary 110 volts. Secondary 2.5 volts at 10 amps. 6.32 volts at 5.5 amps. 6.3 volts at 1 amp. **$1.95**

NOW READY — ECA FM-Television Sweep Generator — defies all competition. Only $34.95! — Write today for special bulletin.

TERMS: All prices F.O.B. N.Y.C. All C.O.D. orders must be accompanied by 20% deposit.

ELECTRONIC CORPORATION OF AMERICA

353 WEST 48th STREET • NEW YORK 19, N. Y.

ECA — ELECTRONIC CORP. OF AMERICA

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

(*from page 56*)

terrupted except for several months in Nicaragua during 1935. XE1KE is part owner and General Mgr. of Cine Sonido, a division of the Azteca Studios, which produce Mexican movies. B. J. claims his greatest feat, other than giving 6 meters heck, was during a 60-day visit to Washington, D. C., this year when he found his W call had expired and it was necessary for him to take the exam again in order to operate the mobile rig he brought along. It seems that after taking the exam and receiving his old call of W3PH back, less than 2 hours had lapsed! Like many others, XE1KE expects to return to the States some day and settle down—in sunny southern California.

G5BY, Hilton O'Heffernan, obtained his call in 1925 at the age of 18, and since 1930 his main interest has laid in v-h-f work. For a number of years prior to WW2, Hilton was with Philips Lamps, as chief engineer in the public address dept., and during the war was with the British Broadcasting Corporation, in the transmitter section of the engineering division. Unmarried, he was living with his parents at Croydon until the outbreak of war in 1939. After the death of his parents he decided to give up the home in Croydon and start up afresh in S. Devon, where he had been stationed during most of his service with the B.B.C. Other hobbies enjoyed by G5BY are lawn tennis, table tennis, contract bridge and owning and driving fast sport cars. Between 1925 and 1937 more trophies were won in league and inter-county table tennis tournaments than have ever been obtained in radio contests. Hilton's present car, purchased shortly before the war, has faithfully carried G5BY back and forth from the shack, and has been driven on occasions to 98 mph. Perhaps one of his greatest disappointments was his watching Wilmer Allison, W5VV, play many times in England with the U.S. Davis Cup Tennis Teams, never realizing that in a few years both were to become ardent v-h-f indulgers. Now with 18 acres available for antennas, G5BY is never happier than when at work on new beams, even cutting the timber and only calling on the local power man to help with the erection.

Oscar Landoz, VE1QZ, is employed at the Naval Research Establishment in Halifax as a physicist in charge of electro-acoustics, which helps to obtain that green stuff, which constantly pours down the funnel of "Ham Radio Inc." The first taste of 6-meter DX for VE1QZ was on May 23, 1947, when W1LLL answered his CQ. Although nervous, the real sticker for Oscar was getting his tongue around those 3 Ls. Band openings for VE1QZ were made possible by careful watching of 28-mc conditions, listening to G5BY and G6DH's comments on 28 mc, and many hours of listening and calling whenever things looked hopeful. One opening reported to him by VE1BC caught Oscar in bed, which made the XYL most unhappy! V-h-f interest began in 1938.

VE1QY, Jerry Grant, is with one of the local

144 MC Honor Roll

W1IZY	12	4	VE1	W8QKI	7	4	VE3
W1IPV	11	4	VE1	W3RUE	5	3	VE3
W1JFF	11	4		WØWGZ	4	4	
W9ZHB	9	6		WØDDX	2	1	
W9LWE	8	5		WØMZH	2	1	
W9IPO	8	5		WØRNC	2	1	
W9BBU	8	5		WØZJB	2	1	

furniture stores, is married, the proud licensee of 3 harmonics, and just waiting for the wx to clear to put up the 16-element, 420-mc beam. An 829-B outboard on 144 mc is really perking, so Jerry has hopes of nice contact this summer on these bands, along with the Es on 50 mc.

Bill Coburn, W1AF, is holding down two jobs now since the war, which makes the 6-meter operation suffer. However, on a part-time basis, Bill managed to work some 27 states along with G5-6-F8-PAØ and VE7. On Jan. 23 a good start was made for 1948 when Bill worked 10 states.

From northern Michigan we find W8YLS doing a lot of listening on the band, and on Jan. 24, the first opening in '48 came about for the W1s. The rig at W8YLS is an 829-B with 70 watts, feeding a 3-element beam. A home-built converter into an SX-25 compromises the receiving setup.

W8ZVY, ex-W9USH, is a captain in the Air Force, and attending the Air Institute of Technology at Wright-Patterson Field in Dayton. Bob received his regular army appointment in July, 1946. V.H.F. is not new to W8ZVY, for as early as 1938 he and his brother, WØUSI in Brookings, S. Dakota, began "piddling" on 5 meters. The DX openings in November were really sensational, according to Bob as he has kept a record of all the openings and is now busily trying to figure out some way of predicting when the band will open. There seems to be no regular cycle for Es, but the F-2 skip follows about a 26.8-day cycle as expected, and the predictions by Ferrell come in mighty handy. During the height of the Nov. DX, W8ZVY noticed that the scattered rebound signals came in just prior to the DX signals, while some openings had none at all. Summing it all up, says Bob, the best solution is to twiddle the dial all day, if you are rich and don't have to work for a living, for it is certainly agony to have to pull the big switch and go off to work when the band is just starting to get all het up—with signals.

The Wide Open 7th District

Arch McArthur, W7JPA, says that even on 6 meters some guys won't QSL—Grr, Grr! Mac noticed that Es signals were bothered by extremely high noises, while the F-2 openings were in most cases the strongest ever heard on 6-meter openings. Mac makes his living threading film at the local cinema, but actually lives only for a 6-meter opening along with the rest of the Sad Sack Net in the Yakima Valley.

W7HEA, Orville Bishop, was first licensed in 1920 as 7WJ, then became a Marine radio operator from 1924 to 1934. Radio servicing then came along so Bish entered same and at the present time has a most enterprising shop. The existing call W7HEA, was issued in 1937 and work was started on the old 56-mc band, until the war. Bish then did several years with the Naval aviation branch in radar and radio work. Bish loves to tinker with converters, especially grounded-grid amplifiers and has quite a log of notes, which should prove very interesting when compiled and presented in an article.

W7BOC received the 6-meter needle from the rest of the Sad Sacks in 1946, and since then spends all his idle time, aside from running a ranch and doing motor tune-up in his garage, operating 6 meters.

W7CTY, licensed in 1933, was active on 5 meters, and as soon as the signal-hunt started on 6 meters, joined the fray. Frank is a radio and general serviceman for a large hardware store, but time is still found to operate on 6!

W7FIV was licensed in 1934 and spent most of his time chasing DX on the lower frequencies until

Sept., 1947, when a bad case of 6-meter jitters developed, which landed him right in the middle of the trans-con hops to the East.

A real old-timer to join the v-h-f ranks is W1NF, Art Erickson, who has been a ham for the past 45 years. Art worked over 40 West Coast stations on the trans-con hops, and had 20 contacts with the Gs, with plenty of other DX heard. Art mentions that DX can be 7 days ahead or behind the sunspot peak. On Oct. 25–26 he observed 12 spots and the DX peak came on Nov. 1. W1NF is an electronic instructor at the U.S.N. Shipyard, Boston. Licensed as a commercial in 1910 to 1917, he operated as a ham beginning in 1903. Operation on the 56–50 mc band has been done since 1931. It has been a thrilling adventure watching 56–60 mc, then 50–54 mc, the former's average DX of 12 miles stretched out to 10,000 miles. Art mentions it was strictly "Quasi Visio, or sumpn," in 31 compared to present day results. The rigs at W1NF include all bands to 10,000 mc.

Louie Cox, W7ACD, combines farming, flying and ham radio all in one great big bag of fun, even though he has 150 acres of potatoes, sugar beets, grain and hay along with 1,000 acres of farm grain 30 miles away. This is where the flying comes in, for Louie and his Taylorcraft are inseparable, for flying to the "lower forty," also to herd cattle and sheep, and to visit the hams who are well spaced in his locality. Louie received his ham ticket in 1928, and was on with a 210 Hartley until he rebuilt in 1941 with 35TGs. The rig worked as a push-push doubler on 56–60 mc, when the v-h-f bug just naturally took hold, for he was the only Idaho station active and naturally became quite popular with the boys. Louie is married and adds that the XYL is okay as a navigator, sometimes, for once he took off for Gashland and ended up with W6UXN in Los Angeles. Oh, well, it's still fun.

Ted Fabian, W8RUE, in Pittsburgh has seen his share of 5-6 meter DX, and has been one of the consistant occupiers of these bands in the Pittsburg area. Ted uses a combination 2-6 meter r-f section with switching for each band. The 6-meter final has a 4D32 with 100 watts and the 2-meter final is an 829B with the same input. So far on 6 meters W3RUE has worked 146 different stations, and 114 on 2 meters, the best DX on 144 mc being 385 miles to W8AKR. Ted doesn't mention what he does for a living; perhaps he runs the lottery on what dates 6 meters will open??

W5LOW, ex-W9BDL, is a supervisor in the Electronic Division of the Naval Air Station in Corpus Christi. Elmer's operation was held down because of living in a Government housing project, but lots of fun was had with his 200 watts to VT-127As and 3-element beam 18′ high. Now that the Navy is closing the Air Station down, Elmer is moving to other parts, but wherever it is 6 meters will be included in the day's curriculum.

The Voice of R. I.

Rhode Island's lone representative, W1GJZ, Ernie Grant, gets his bread and butter as the regional service manager of the Underwood Corp. in Providence. Ernie received his ticket in 1933 and has never been lower in frequency than 28 mc. Ernie was on the 5-meter band in 1933, although at a QTH in Mass., with one of the first xtal rigs heard on the band. The biggest thrill for W1GJZ, outside of working HB8VK, was when the W6s started coming through. Although Ernie's work is keeping him quite busy, he is planning to give as many of the gang as possible their R.I. contact this summer.

Naturally, we must have a professor in our midst, so now let's look upon Bill Carley, W4WMI. Bill spends his winters as a professor in the electrical engineering department of the University of North Carolina, near Raleigh, but during the summer vacation and holidays, one is not surprised to get a call from W4WMI/4 at his home in Georgetown, Ky. Possibly his reason for scurrying home is that Bill says the ground wave DX from Georgetown is much better than in Raleigh, or so it seems. This summer, if anyone interested in running checks on 235 (220) mc or 420 mc, Bill will be on in both Raleigh and Georgetown. If you are near him and on these bands, please drop Bill a line at 126 Henderson St., Raleigh, N. C.

Miles Newton, W4EID, of Jacksonville, Fla., is a student at the Univ. of Florida and doesn't have much time for 6 meters, but always gets in on the openings. Miles and W4GJO go round and round on both 6-2 meters on ground wave. Just out of the Navy, Miles says he is 25 years old, single, and won't send us a picture as he would be bothered by marriage proposals and movie contracts, which he isn't interested in because it would take away from his operating time on 6 meters; course, other operations are nice, too!

Out western Texas way in Amarillo, W5WX, Bert Arnold, watches for band openings by using a superregn, because its broad and saves a lot of tuning. Bert is retired from the ham store he formerly owned, so now his occupation is riding a rocking chair, while observing the XYL's efficient house and yard work, and listening intently for a signal to break through on 50 mc. Bert has held the same call since 1923, became interested in 5 meters in 1940 and has been on v.h.f. ever since. Contacts have been made with 184 different stations in 1947, and 405 repeats, using 50 watts and a 3-element beam.

Doc Farrar, W1CLS, ex-W8CLS, backs up to the pay window of Raytheon Mfg. Co., in Waltham, Mass., doing duty in the contracts service division. Doc is well known for his outstanding signal both on 5 and 6-meters and wound up with 378 different stations worked in 44 states during 1947. The rig uses a pair of 4–125As with 250 watts and for a while he used two stacked 4-element beams, which have been replaced with a single 4-element at 68′. Extensive checks on ground wave with the stacked array did not show much of an improvement over the single 4-element, .2-wave spaced job. Doc has worked all stations heard in the States but still lacks Colo., Utah, Wyoming and Montana.

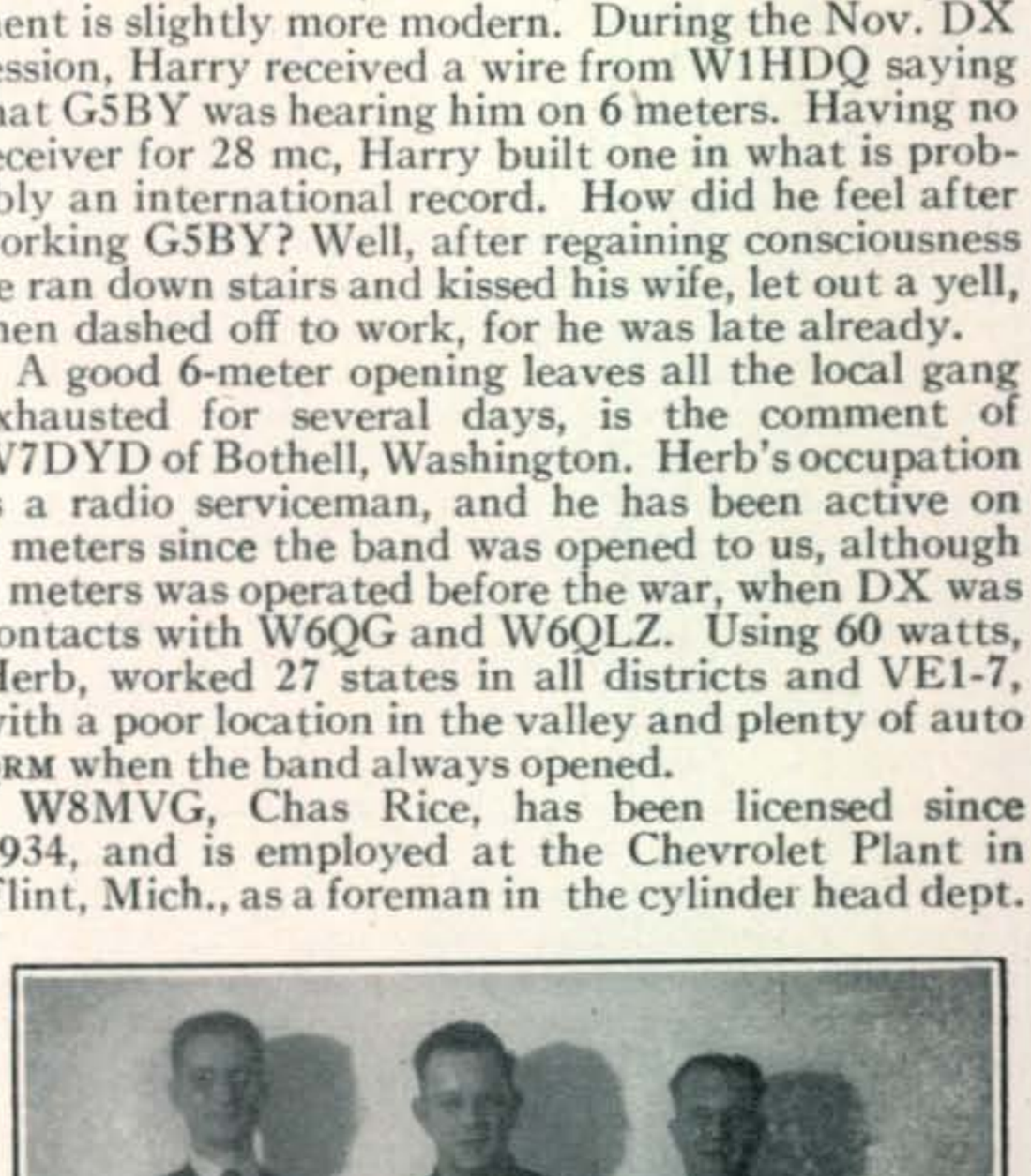
Doc Farrar, W1CLS, ex-W8CLS.

Someone has to hold down the last place in the Honor Roll, so says Harry Miller, W9AB. V.H.F. is not strictly new with Harry, for his log shows a crosstown contact with W9CRZ on 224 mc in 1935. In 1915, W9AB, bought a key to learn the code and

that same key has been used to good advantage on 6 meters ever since; however, the rest of the equipment is slightly more modern. During the Nov. DX session, Harry received a wire from W1HDQ saying that G5BY was hearing him on 6 meters. Having no receiver for 28 mc, Harry built one in what is probably an international record. How did he feel after working G5BY? Well, after regaining consciousness he ran down stairs and kissed his wife, let out a yell, then dashed off to work, for he was late already.

A good 6-meter opening leaves all the local gang exhausted for several days, is the comment of W7DYD of Bothell, Washington. Herb's occupation is a radio serviceman, and he has been active on 6 meters since the band was opened to us, although 5 meters was operated before the war, when DX was contacts with W6QG and W6QLZ. Using 60 watts, Herb, worked 27 states in all districts and VE1-7, with a poor location in the valley and plenty of auto QRM when the band always opened.

W8MVG, Chas Rice, has been licensed since 1934, and is employed at the Chevrolet Plant in Flint, Mich., as a foreman in the cylinder head dept.



Members of the Sad Sacks Net, L to R, back row: W7JPA, CTY, BOC. Front row: W7HEA, FIV.

His QTH is a ten-acre farm, two miles west of Clio, Mich., where all the dirty work is done on 6 meters. Chas moved to the farm with a lot of ideas about rhombics for DX work, but became interested in v-h-f work, and here he is for good. All his receiving gear was traded for an S-36A, but after tuning 6 meters for several weeks and hearing no signals he thought he had a lemon. But the same day he checked the tubes, W5ML broke through and since then it's been 6 meters full time. A rebuilding job came then as a pair of 75Ts was purchased for the final, which was finished the night of Oct. 27. The following morning a c-w contact was made with W2BYM and W2AMJ, who were calling PAØUN. PAØUN was contacted the next day by W8MVG, and W5BSY/MM was heard calling CQ, but Chas didn't answer, much to his regret, for he was off the coast of Africa at the time. Chas noticed that when the band was open for Europe he could hear the W1s and W2s on scattered rebound, and that no DX was ever worked unless the rebound was coming in. W8MVG has had 134 contacts on 6 meters since

May, 1947, and 32 of those have been with Europeans.

AB Adams, W4FNR, in W. Palm Beach, Fla., has been on v.h.f. since 1938, going xtal in 1941, and was back on 6 meters by April, 1947, right after his discharge. The rig is a pair of HK-24s with 100 watts and a 4-element beam. In October AB worked OA4BG and OA4AE for his greatest thrill on any ham band after hunting them for several weekends. W4FNR has heard the W6s many times, but thinks it takes higher power than his to raise them, as his luck with them has been nil.

The Texas Mays

Now for a real story, we tune into Leroy May, W5AJG, of Dallas, Texas. Leroy is fortunate in that his XYL is also blessed with a call, W5JKM. Well, it seems that one day Leroy takes off to Skippy's Ham Smoke House on Deep Elm St., and was busily trying to sell the local gang on v.h.f., when W5ABN called him on the phone and said W5JKM had just worked England on 6 meters. Relating further it seems that W5ABN's OW had called Leroy's OW (W5JKM) on the phone, and that all she could say was that she had worked a G on 6 meters, then let out a yelp and everything was quiet. Leroy rushes home and finds the 6-meter log with three Gs having been worked. Now let's turn to W5JKM's side of the story, and we quote: "The OM having the day off went to town to buy more parts, and left with a parting shot to keep an eye on 6 meters, or it would be back to mother's. After 17 years of house work and anything to keep the home fires burning we finished the breakfast dishes, fed the dog, changed the baby, etc, etc, started upstairs to finish the housework and as I passed the den, noticed the receiver still on, and from force of habit I twirled the dial and hit a loud c-w signal. Now code has always been a weakness so we listened very intently, muttering to ourselves that we evidently had a new local. But leave me see if I can copy him, this ambitious fellow calling CQ. Yep, it's still simple this here c.w.—there was the five, then a B then a D, goldurn locals! But let me check and be sure—yes 5BD, but somehow the first letter didn't sound right—DAH DAH DIT. That's no W, what's the matter with that guy—DAH DAH DIT. Why that's no W, it's a G, a G, oh GEE" (Ed. note: from there on *even* the typewriter at W5AJG-W5JKM starting mispelling.)

Activity around the Salt Lake area has picked up and W7EWX sends us the info on the gang there. W7SP is ex-W6EYS and is active on 6 and 2 meters with a pair of 75Ts, and an S-36A receiver. Zim has worked 26 states on 6 meters and VE1–2–3–7.

W7EWX, ex-W6EWX, is also active on both 6 and 2 meters with an S-36 receiver, having worked 22 states.

W7QQD, ex-W6QQD, is on 6 and 2 meters with 300 watts with DM-36 converter and a home-brewed one on 2.

W7JPN, ex-W6DZX, is on 6 and 2 meters with a pair of 100THs, VHF-152, and HQ-129X. He has 19 states, VE7.

W7PJS, ex-W6JPS, is a new addition on 6 and 2 meters with a 522 and converter.

W7KMR, just joined the ham ranks, and has 100 watts on 6 and 2 meters, with a VHF-152 and HQ120X.

W4JML, Jim Gatliff, Jr., is president of the High Splint Coal Co., in Williamsburg, Ky., and his setup includes a rig, and most of them separate ones at that, on all the amateur bands. Jim has 400 watts on 6 and a 522 with 24TG final on 2 meters, the receiver a VHF-152. Local contact is with W4KRY

in Somerset, Ky., and both of them get on around 1900 CST, to talk about the DX that is bound to come through, sooner or later!

Here's news on a member of the Beaver Net, now extinct. Warren Sharp, WØDKS, is now a radio engineer with CAA and stationed at Des Moines, Ia., but attending the Communications School in Oklahoma City. Warren hopes to be back in Des Moines by April and is planning some nice beams on both 6 and 2 meters. WØDKS was the only Beaver who was able to contact XE1KE last summer—$$% !

W9AB in Mishawaka, Ind., says that 50 mc is at an all-time low, for W9ZBK in South Bend has provided him with the only contact for 1948.

What does your scribe, WØZJB, do for a living? Well, at the present time we are with a company that is doing, or going to do, television installations in the Kansas City area, along with the electronic sales of General Electric Tubes and associated equipment. Lots of things are planned, but we just can't seem to get them all done what with a wife, a 2-year old daughter and a job or jobs, time seems to flit by.

None other than WØZJB himself.

144-mc Notes

Activity in the Kansas City area is at an all-time high on 2 meters. All the gang use xtal controlled, beams, and superhet receivers or converters. Thursday night is emergency net meeting on 144.125 mc with WØDDX net control. Members and active participants are: WØDDX, WØDCH, WØDEF, WØMZH, WØBYS, WØZIB, WØUWV, WØAE ex-WØAHZ, WØQZA, WØEIB, WØZJB. Some DX is provided by WØRNC in St. Joseph, Mo., 45 miles to the North and interest has been shown by WØBHG in Excelsior Springs, Mo., 35 miles to the NW, and WØJQT in Lexington, Mo., 40 miles to the West.

For the last month yours truly, WØZJB, has been running skeds with the Iowa gang around Des Moines, but without apparent success, until Feb. 19, when WØAEH heard us twice, the distance being 200 miles. WØAEH had just erected a 12-element H array, up 60′. No doubt the answer to the DX hauls is a stacked array. The receiver at WØAEH is a 6J6 broad-band mixer into an RME-45, which Ortho says is plenty hot. The power at WØZJB is a 522 driving a 3E29 with 120 watts and a 4-element beam 30′ high. The night of Feb. 19 was perfect for bending as the temperature during the day was 70°,

and by Friday morning had dropped to 5 degrees. At any rate it has all of us encouraged and some nice stacked arrays are planned here in the Mid-West, horizontal of course. Those trying verticals are soon driven to horizontals because of the experience in trying both; then, too, the majority rules, yuh know!

Around the Dayton area we find WØZKW with 300 watts, W8ZFO, W7ITW/8, W8BFB in Cincinnatti, and W8WXG in Springfield, along with W8ZVY in Xenia, all active, with 522s as xmtrs and receivers. All antennas are horizontal and the best DX so far is 50 miles, but will no doubt be stretched, come this summer.

In the Ames, Ia., area, meeting time is 2000 CST, nightly, with these: WØAEH, CYL, OTD, PKN, CHI, HVE, WGZ and TIO. All stations are using 522s except WØOTD and WØTIO who have outboard 829Bs. Consistent DX is 50 miles, but WØTIO has worked WØNFM in Solon around 120 miles, while WØAEH in Ogden has worked Des Moines, Grinell, Ames and Slater, and heard Davenport and Solon. The Kansas City gang is looked for each eve at 2100, but WØAEH is the only one who has heard any of them. A new station is on in Red Oak, Ia., just across the Ia.-Mo. line, which should make the relay point to extend the 2-meter net into Chicago.

W9AB says that 144 mc is picking up, whereas 6 meters is falling off. Harry finally got his new 2-meter converter built, using 26J4s as grounded-grid amplifiers, with a 7F8 as osc-mixer. The aligning was the hard part, but after completed it is really hot. Harry was tuning the band one Sunday at 10 a.m. and right in the middle of same was the second harmonic of the TV station in Chicago, a distance of 100 miles.

WØIPI, in Ommitz, Kans., 20 miles NW of Great Bend, is very interested in 2 meters but is handicapped for power as he has to generate his own. He hopes to have REA in soon and will get some xtal equipment on. His towers are 65′ high, so some DX is expected.

SK

By the time this reaches you the Es season will no doubt have started, so good luck and remember for ease of reporting, just drop us a line requesting the reporting forms. Thanks to you for the personal info, and how about some more from the rest of the gang?

SUPERCONDUCTIVE DETECTOR

(*from page 22*)

degree. Thus, a bolometer of this type is sufficiently sensitive to pick up the heat of the flame of a single candle at a distance of about 20 miles.

Making a slight change in the temperature and connecting the amplifier to a loudspeaker allows the bolometer to detect local broadcast stations. A tuned circuit is placed in series with the bolometer. The sensitivity of radio wave detection varies and generally drops off at about 1600 kilocycles. New experiments have shown that the sensitivity is restored at about 50 mc. and is very high at 105 mc.

While undoubtedly, the superconductive bolometer will never replace the usual radio receiver, it is, however, interesting to speculate that superconductivity experiments have shown that resistance noise may be reduced by about 8 to 10 db in certain cases. Probably noise reductions of a similar nature can be made in the first r-f stage circuits of radar receivers, thereby increasing their sensitivity far below the normal limits. —*O.P.F.*

ZERO BIAS

(*from page 13*)

would then have 10 meters as an almost exclusive phone band to make up for 40 which is almost exclusively a c-w band. However, this is a decision which the phone men themselves must make.

The 21-mc band, if it followed our general policy or 50 per cent phone and 50 per cent c-w, would actually consist of a smaller American phone allocation, but in view of the success of the 28-mc sharing plan, and since 15 will have to absorb much of the 10-meter activity when 10 closes due to poor conditions, we think a larger phone than c-w band is justified.

Regardless of whose views eventually prevail, there is little doubt that this healthy discussion will result in a plan equitable to the greatest number of amateurs. We believe that the divisions outlined above are most fair to the greatest number of hams.

—W2IOP

LETTERS

(*from page 8*)

acquire phone experience with low power where he can do less harm to himself and others. This will give Class B their band and at the same time provide the band with the daytime occupancy it so badly needs.

The VEs no longer have justification for that precious extra 50 kc. Their average power level is about par with ours, so why not share and share alike. A lot of Ws have seldom worked VEs simply because they never got down to that end, so actually it would foster better relations with our good neighbors to the north.

Mobile operation should be allowed on all bands. This more than any one thing could stimulate interest in low frequency emergency gear which is something we all should have, but don't.

The ARRL has at Atlantic City recently completed a trying task well done. The League deserves the support of all of us, but it also deserves constructive criticism and suggestions directed to those who can effect them.

We all have ideas on what changes and improvements we would like to see take place. Therefore, it behooves every one of us to ask, tell and vote (elections and polls) for these improvements and changes instead of accepting as matter of fact decisions made for us.

F. Cecotti, W7JBH

ANGLE OF RADIATION

(*from page 43*)

sary to make the antenna directive—not only horizontally—but in the vertical lobe pattern as well. It has been shown that the vertical lobe need only be 8° in cross-section to operate satisfactorily under all types of ionospheric conditions. The lowest useful lobe should be between 4° to 8° on 10, 20, and 40 meters for DX. 20° is the upper limit at 10 meters, 25° at 20 meters, and 40° at 40 meters. Any energy radiated outside of these limits is wasted.

The means to obtain these desirable properties have not been developed. Contrary to the popular suggestion, there is more to be lost in tilting the beam

than in keeping it horizontal and on an even keel. Theoretically speaking, calculations show that for any angular tilt above 15° in the plane of the beam (i.e., raising the director above the plane of the radiator) will result in a decrease in the amount of power radiated at the lower and most useful angles. A tilt of about 30° will result in an average power loss of approximately 12% in the lower lobe. Tilting upward to 45° results in a loss of about 25%. At the same time there will be a corresponding increase in the radiation at the higher angles—particularly those above 40°. Therefore, at 20 meters tilting does not represent any advantage.

At 10 meters and 6 meters, where the height of the antenna may be more than one wave-length above ground, the tilting may result in some improvement in the radiation pattern. An example of this would be a 10 or 6-meter beam which was 75 to 100 feet in height. At this elevation there would be sufficient low-angle radiation for all practical purposes, but there would also be a deep null at the angles commonly used for short-skip work. Tilting beams at this frequency and height above ground would tend to fill in this null at the expense of some low-angle radiation—resulting in an improvement in the overall performance of the beam.

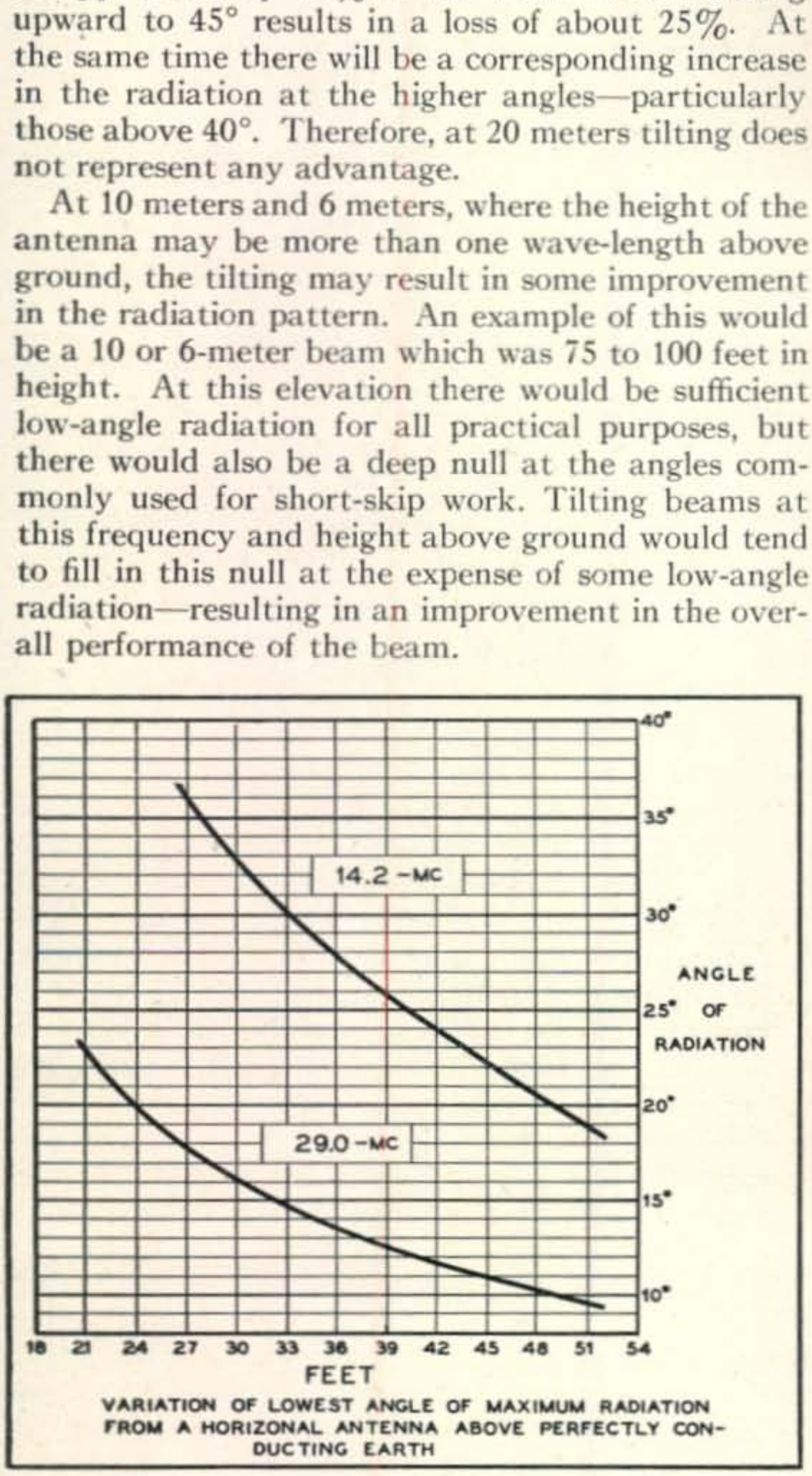


Fig. 6. Change in the angle of radiation through variation of the height above ground.

The only *real means* of varying the angle of radiation is by changing the height of the beam above ground. Formula (1) gives a positive means of estimating the rate of change in the angle per unit of height. *Fig. 6* shows a simple plot of the variation for two amateur frequencies. On 10 meters (29.0 mc) a change of 3 feet at the usual heights results in a change of 1° in the angle of radiation. At 20 meters the change would be about 2° per 3 feet of increase or decrease in height. If the mechanical method is available to raise or lower the horizontal beam, the change and the improvement in the angle of radiation pattern may often be worthwhile. Otherwise, for a fixed height—select the most useful angles and set the beam for that height.

STORM INDICATOR

(*from page 24*)

the side motion of the eye when reading the instrument. A small light will also be necessary to illuminate the scale. Naturally, the scale and mirror of the variometer are mounted in the same horizontal plane.

If a reasonable degree of caution has been observed in the construction there should be no complicating factors in getting the variometer to work. In setting up, the scale and telescope are mounted south of the variometer proper. The north seeking end of the magnet is pointed to the east and the torque taken up in suspension twist. The center line of the suspended magnet and the center of the scale should be parallel to the magnetic meridian of the earth. This can be determined beforehand by using a sensitive compass, plus an isogonic map showing the east or west deviation for your particular geographic location. This arrangement is illustrated in *Fig. 4*.

Sensitivity and Readings

If the scale of the instrument is located 176 centimeters from the mirror it will be found that the deflection of one millimeter in the scale is equal to one minute of arc. This is sufficient sensitivity to note even the most minor of magnetic or ionospheric storms. After several years of observations here in St. Cloud, Minn., we have found no discernible variation due to the lunar influence (which can be picked up on more sensitive instruments). There is a pronounced solar or daily variation which is quite noticeable, but since it occurs regularly each day it causes no difficulty in taking readings. Our method provides only for visual readings which are taken at frequent intervals and in this way we generally have sufficient warning of approaching ionospheric disturbances.

Speaking in terms of relative units, the solar variation is between 30 and 40. The smaller variations occurring during the winter months when the sun is low in the southern sky and the larger values during the summer. During a magnetic storm there may be variations as great as 2000 to 3000 units thus storms may be easily recognized.

THE AMATEUR NEWCOMER

(*from page 33*)

tive with respect to the cathode. Thus an increase in plate current flow is counteracted by an increasing negative potential on the grid, tending to limit the plate current flow and stabilize it at some point which will not damage the tube.

We have seen that the use of a cathode resistor places the cathode more positive than the negative of the plate supply. That is, since the cathode is the tube's effective zero point, we lose some plate voltage —an amount equal to the drop across the cathode resistor. In the case of low mu tubes the resistor voltage drop to afford complete protection may be so

large that excessive plate voltage will be lost and the whole system may be found less economical than inserting bias batteries in the grid circuit. Moreover, when the amplifier is loaded by the antenna, the plate current will increase. This increased current will in turn raise the amount of voltage drop across the cathode resistor, making the grid more negative, and limiting the loading which may be achieved. In using the cathode resistor, remember that effective plate and screen grid voltages are measured from the cathode, and that the resistor must be so chosen as to give the proper proportion of plate and screen voltages, as measured from the cathode, and yet retain some measure of protection.

It was noted above that, with either type of grid circuit, the grid resistor was isolated from the grid itself. In one case this was done by means of the grid coil and condenser, which, when tuned to resonance, present a high impedance to the flow of r-f current. In the other case the isolating element was an r-f choke, so designed as to offer a high impedance at its resonant frequency. In either case the objective was to prevent r.f. from reaching the receiver. If this were not done, the current flow would become excessive, possibly destroying the resistor.

As an added precaution, the top of the grid resistor may be grounded by a small bypass condenser, thus effectively short-circuiting any remaining r-f voltage.

In amplifiers it is desirable to measure the flow of rectified grid current, because this is a fairly reliable measure of the amount of excitation being impressed on the tube. Of course, this assumes that the value of grid leak is correct for the tube and operation contemplated. If the resistor is too small in value, the flow of current will appear to be great, whereas the developed excitation voltage in reality is small. If the resistor is too great in value, the opposite condition will be true.

This measurement may be done conveniently by opening the circuit at the point where the grid-bias resistor is connected to ground and inserting a low-range milliammeter. In the amplifier shown, the grid resistor may be disconnected from the ground bus and a 0-5-ma meter inserted, with its negative terminal toward the grid leak. It will then be possible to measure the grid-current flow.

Neutralization

A few paragraphs back it was noted that the amplifier circuit was the same as that for the tuned-plate tuned-grid oscillator. This holds true even when the resistance-capacity method of coupling is used, for in this case the plate coil and condenser of the oscillator are effectively in the grid circuit of the amplifier.

The question then arises as to why the amplifier does not oscillate by itself, as did the oscillator. The answer is that oscillation will occur, with obviously detrimental results, unless precautions are taken to prevent it.

When we examined the oscillator we observed that oscillation was sustained by means of feedback within the tube or external to it, and that this feedback might be capacitively or inductively produced.

(*Continued on page 106*)

Still earlier, in the case of the regenerative receiver, we noted that the position and connection of an inductance used to supply feedback were important, and that no feedback took place unless the coil was connected in the correct manner.

From this it is evident that feedback, and hence oscillation, was introduced when the voltage taken from the plate circuit was of a polarity correct to *reinforce* the grid voltage present. If the plate-voltage polarity were incorrect it would tend to cancel out the grid voltage, and hence oscillation would never be sustained. The same principle is used in preventing an amplifier from oscillating by itself.

The simplest device for accomplishing this is a condenser so arranged as to feed to the grid a voltage opposite in polarity to that which would be fed back by the natural grid-plate capacity of the tube. To do this the plate coil is constructed so as to have two equal halves. The whole coil is tuned by the plate tuning condenser, but the voltage is fed to the coil at the center. When the r-f voltage develops across the tuned circuit, the polarity at one end of the coil will be exactly the opposite of that at the other end. Regardless of the polarity at the plate end of the coil, the polarity at the other end will be exactly the opposite, and of a value sufficient to cancel out the tube's internal feedback, provided the coupling condenser is properly adjusted.

The above statement is based upon the assumption that the coil is exactly symmetrical, that the capacities across the two halves of the coil are equal, and that the capacities of both ends of the coil to ground are equal. In actual practice most small inequalities which occur tend to cancel out, but certain layouts of components sometimes prove difficult or impossible to neutralize.

To adjust the neutralizing condenser, excitation must be supplied to the amplifier, but the plate and screen voltages are not applied. The tube filament is lighted. An indicator of some sort is placed in the plate circuit. This may be a panel lamp connected to a loop of wire and placed around the plate coil. A more sensitive indicator is a meter in the grid circuit of the amplifier, if one is available.

Grid and plate circuits are tuned to resonance, and in this condition it will probably be possible to observe some signs of r.f. in the plate circuit, as evidenced by a glow of the lamp. This indicates that unwanted grid-plate coupling is present and must be canceled out. If the meter is used, tuning the plate condenser through resonance will produce a flicker in the grid current, observable on the meter. The neutralizing condenser is then adjusted by means of an insulated screwdriver until the glow disappears from the lamp, or the grid meter fails to flicker as the plate condenser is tuned through resonance.

If the amplifier is to be operated as a doubler, in general the neutralizing circuit need not be included. In this case the plate circuit will operate on a harmonic of the grid circuit, rather than on the same frequency, and hence there will be no feedback at the same frequency as the exciting voltage to sustain oscillation.

When neutralizing has been completed, the amplifier is ready for normal operation. A milliameter

of around 150-ma full-scale reading may be inserted in the jack. Make certain that the oscillator is supplying excitation, and apply the plate and screen voltages. The plate tuning condenser may be rotated to establish resonance, and at this point the plate current should dip sharply. This indicates that the plate circuit is in resonance, producing high impedance in the circuit, and hence a low d-c current through the tube. If a milliameter is not available a 6- or 7½-watt electric lamp may be connected across the link terminals. The amplifier will be in resonance when the bulb glows brightest.

The amplifier may be used at plate voltages as high as 500, and plate currents as great as 100 ma. Since plate and screen have been connected together at their respective socket terminals, the tube is operating as a triode, and it is not necessary to worry about correct screen voltage. Under conditions of 100-ma plate current at 500 volts, the plate power input will be 0.100 x 500 or 50 watts, less, of course, the amount of power lost by the voltage drop across the cathode resistor. The power output, with the amplifier properly matched to antenna or dummy load, will be in the neighborhood of 37 watts at 75% efficiency.

Under good conditions the signal from the oscillator-amplifier combination might be heard anywhere in the world. It literally annihilates distance, and hence must be carefully handled to avoid causing unnecessary interference to licensed services. Under no conditions should it be connected to an antenna by an unlicensed person, and even a dummy load should be shielded so as to avoid radiation.

DIRECTIONALS

(*from page 47*)

angle to the horizon and represents the response that can be expected in a local area where sky wave is either negligible or non-existent. Significantly, however, one should note that these minima likewise hold for the vertical pattern, stations in directions that they "protect" nearly always being at some point far removed from the primary ground-wave area.

It has been the intent of this brief presentation to call the reader's attention to the fact that it is possible to obtain a very extensive variety of patterns from two vertical antennas by adjustment of phase and antenna current ratio. Further, to suggest that if the basic pattern of two vertical antennas could be altered *from the station end*, it would be possible to not only produce rejection notches in the direction of interfering signals, but to adjust as well for maximum forward gain. There are many problems to be solved before an idea such as this can be made workable, particularly for amateur operation where the operating frequency is constantly changed. However, this approach, if even partially successful, could well be a starting point toward the ultimate goal—the ability to change the position of the maxima lobes (or minima nulls) to any desired direction without the necessity for changing the direction of the elements!

HEAVEN FOR HAMS

(from page 45)

off when it comes to owning his home and a bit of land.

Modern double-decker busses service all cities. The arts and sciences get their full play of interest and development. Its wealth of diamonds and gold make South Africa one of the few stable countries in this troubled postwar world.

◆

ZS2AG and Pal.

◆

Sick of this terrific W competition, fellows? If so, all you need is 200 South African pounds, a promise of a job, and a little guts to settle in a lovely land where those hard to get Asians are a reality rather than a dream. Why not see your nearest South African consulate now?

SO I BOUGHT A 348-Q

(from page 28)

particular antenna being used. This means adding an antenna trimmer condenser in the same manner it is used on several popular communications receivers. But it takes a lot of nerve to make this change, because some plates must be removed from the antenna coil section of the main gang tuning condenser.

The plan is to install a 100-$\mu\mu$f midget variable condenser in parallel with the 19-plate antenna condenser (1-A). Of course, the antenna condenser must be made smaller if a manual trimmer is to be used in parallel with it. Here's how.

Cut a hole in the front panel exactly 2" to the right of the r-f gain control (the position of the old dial lamp rheostat). In this space, which is directly in front of the first r-f stage, install the 100-$\mu\mu$f midget variable condenser. Connect the stator section to the same terminal to which is connected the stator section of the gang condenser (1-A).

Now brace yourself, take a deep breath, and go to work on the variable condenser. All sections have 13 plates except the antenna section which has 19. Pull out two of the rotor plates—I took out three without ill effects (upon the receiver)—but two will

let the newly installed trimmer tune the antenna coil.

In its final form the 348Q acts more like a narrow-band amateur communications receiver, and less like the broad-band aircraft receiver it was designed to be. An advertising man might describe it as having such desirable features as 2 r-f stages, high image ratio, single-signal selectivity, variable b.f.o., 5 watts of audio, antenna trimmer, self-contained power supply, vernier tuning, illuminated dial, separate a-f and i-f gain controls, manual and automatic volume control, transmit or standby switch, and phone jack.

This conversion was tested on three receivers and was found to be excellent. It corrects the two main deficiencies of the receiver, poor selectivity and insufficient audio. It still does not have an "S" meter, but S meters don't agree anyway, and in the final analysis it's not the position of a needle pointer that counts, but the ability of your ear to extract intelligence from the QRM serenades that identify the crowded amateur bands. It should be pointed out that the modifications described are equally well applied to the BC-348J and BC-348N.

SCRATCHI

(*from page 10*)

it for raleroad companies. Itchi are settling this by locking shack door and hiding key in neer-by cacktus. He saying that all this are causing big fuss, and partys concerned are hotter than #24 wire used as feeder line for kw.

But big trubbles come when I are finding that fence around Itchi's ranch are connected to other fences, so r-f is traveling all around this part of Arizona. Cattle what are coming in contack with fence are burning off sum hide. This are natchurally causing confusion as cattle brands are getting messed up and cattle are getting more than one brand. Itchi are saying with sly smile that this is a shocking bisness but I are not in my usual humor and are not appreciating funnybisness. Part of the posse that is looking for Scratchi are rounding up cattles and trying to figure out which are rite brand and which are Scratchi brand dew to r.f.

Itchi are just running up and showing me letter we are just receiving from telefone companies. They are inclosing itemized bill what they are wanting me to pay. I are feeling too ill to giving all the detales but sum total are running into plenty monies. Hoken-Saki I are not believing I are burning out 4,326 tubes!! I are noticing that they also charging me with time on three networks, as it seems sponsors are not wanting to pay out hard-earned bux to have peeples listening to Scratchi rag-chewing.

My first reackshun was to rite to F.C.C., protesting that amateurs are not interesting financially in radio, but I are realizing that F.C.C. are probably wanting my address rite now, as are probably having nice stack of pink QSL cards all set to male.

Rite now I are hiding in kave, and hoping posse and hoards of lawyers are not finding me until I have chance to get clothes packed and hed to less active part of this countries. I'll be keeping in touch with you if I are getting away without having to play part of Xmas decoration on sum high caktus.

Respectively yours,
Hashafisti Scratchi

Classified Ads

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

SELL: New BC-348-Q converted to 110 v.a.c. 79 page instruction manual included, $69. Jerry Everett, 1301 McAlmont, Little Rock, Arkansas.

WE REWIND burnt out transformers reasonable. Guaranteed. Frampton Transformer Shop, Box 109, Blackwell, Oklahoma.

BC-696, BC-459, BC-458, BC-457. Simple conversion instructions for above transmitters, including suggested power supplies. $1.00 per set. W8CRX.

HARRISON's Jamaica branch saves time and money for Long Islanders!

WØFOR selling out! Bargains galore in everything in radio. Also Instructograph, oscillator and tapes. John S. Baker, Radio Station KWPM, West Plains, Mo.

COLORTONE QSLs! Outstanding quality. New! Different! Reasonable! Colortone Press, Tupeolo, Miss.

GON-SET 6–15 3 band converter for unexcelled reception. 12" bandspread. Complete with built-in power supply and 8 tubes, $75. Shipped same day. Murray Black, W6UVF, 839 N. June St., Hollywood, California.

PHONE TRANSMITTER FOR SALE. 250 watt, 10 meter, rack mounted. Complete with speech amplifier and ECO. Also DB20 preselector and lot of extra tubes. $200. complete. C. Deppen, 2634 Fairview Ave., Reading, Pa.

POLYSTYRENE FEEDER SPREADERS! Beautiful, featherweight, Hi-Q. Less than half cost of other polystyrene spreaders. 2"—10c, 4"—12c, 6"—15c. 10% discount in dozen lots. Get ahead of the rush! Order now! First come, first served. United Manufacturing Associates, 3605 Canyon Ridge, Fort Worth 3, Tex.

WANTED. CQ's Jan. '45 to July '46. Singles. Groups. WØRVS.

QSLs? SWLs? "America's Finest!" Samples 10c. Sackers, W8DED, Holland, Mich.

NEW HQ129X with speaker and tubes—$147.50. Full factory guarantee. Ralph Barnett, Engr., Radio Station WEW, St. Louis University, St. Louis, Mo.

RADIO TUBES. Tremendous savings. List free. Crest Corp., Dept. A-2, 3949 Forest Park Blvd., St. Louis 8, Mo.

SELL—Hammarlund Super-Pro SP400X. Range .54 to 30. mc. Complete $250. C. Horn, 325 E. 163 St., New York, 56.

QSLs, SWLs, by the QSL King. Samples? W9BHV, QSL Factory, 857 Burlington, Frankfort, Ind.

BELL and HOWELL disc recorder and accessories. Used short time. Cost $175.00. Make offer. Jack Irwin, Candler Field Br. P. O., Atlanta, Ga.

MOBILE TEN METER AM phone transmitters—Stancor type 30M 25 watts, complete with 6v dynamotor, tubes and mike, used, good condition, $35. Have 1-dual frequency, 10 and 80 meters, class B modulator, separate RF sections, 15 Watts, 6v vibrator PS—like new, less mike and xtal, $47.50. L. VanCleave, W9CFJ, Greencastle, Ind.

W2KYV, Hank Fank, is at your service in Harrison's Jamaica branch!

SELL. 50-WATT c.w. transmitter. Absolutely complete with power supply, antenna tuner, tubes, etc., $75.00. Robert Gardner, W2VIV, Fulton, N. Y.

SELL OR TRADE. National 1–10 receiver, coils and power supply. Mossberg 46M repeater and 4X scope. Want Millen exciter and good beam. W2VWM, 73–51 184 St., Flushing, N. Y.

WORKSHOP ROTATOR, like new, $120.00. Clarkstan 4 element, 10 or 6 meter beam, $30.00. B-19 transmitter-receiver, $35.00. William Bates, Reynoldsburg, Ohio.

FOR SALE: Amateur radio station, only $24.50. Receiver & transmitter, 10–40–75 meters. For details, write Stanley MacMichael, c/o R & M Radio Co., 1426 N. Quincy St., Dept. CQ-3, Arlington, Va.

IN STOCK: New and used Collins, National, Hallicrafters, Hammarlund, RME, Millen, Sonar, Meck, other receivers, transmitters, parts, etc. Lowest prices. World's best terms. Reconditioned S38, $35.00; S40, $59.00; SX28, $139.00; SX42, $199.00; HQ129X, $139.00; SPC400X, $249.00; HRO Sr, $119.00; NC240C, $119.00; DB20, $29.00; RME45, $119.00; SX24, SX25, SX16, SX17, SX28A, S36A, HT9, RME69, NC46, NC100A, NC173, other receivers, transmitters, etc. Shipped on ten day trial. Write. Henry Radio, Butler, Mo.

CRYSTAL KIT: Includes 4 low drift, active, calibrated crystals, 2 holders, abrasive, instructions, treatise. State band preferences, 3500 to 8700 kilocycles. $1.00, plus postage. Precision mounted crystals, 80 to 20 meters, ±5 kc., $1.00. Exact frequency, $1.50. Specify mounting. Breon Laboratories, Williamsport, Penna.

SELL: STANCOR 10P transmitter, complete with tubes, crystal and coil, $30. National NC44 receiver, with matching speaker, in fine condition, $45., or will make trade on VHF152 or what have you? W8AYS, 17225 Roseland, Cleveland 12, Ohio.

QSL's QUALITY CARDS, Priced Right. Samples. W9UTL, 1768 Fruitdale Ave., Indianapolis, Ind.

METER SCALES—PRINTED on white enamel paper in most milliampere ranges for 3½ and 2" meters. 35c each, or 4 for $1., postpaid. W5ERX, 1237 So. Toledo, Tulsa 4, Okla.

SUPREME AF-100 transmitter, 140 Watts, AM, FM, VFO. Excellent condition. Cost $550. Sacrifice for offer over $375., f.o.b. All inquiries answered. W2TWK, 61 Hart St., Brooklyn 6, N. Y.

L. I. HAMS! Harrison's Jamaica Branch open Friday nights until 9.

FOR SALE: A lazy kilowatt patterned after the transmitter in April CQ issue, 1946, in Bud 1772 black cabinet. 4–250's final, 810's modulators. Overload and underload relays. Driven by brand new VX101 deluxe VFO, sound plus 30 watt amplifier, four mike channels. S/C Labs, 3 element beam, with motor, and direction finder. Spare miscellaneous parts, coils and tubes. Also Western Electric, steel, 19-inch frame, seven feet of panel space, series cathode modulator, minus mike jack, only $500. You pay the freight or bring a truck. If you live close, and will load you down, write if any questions. Reason—too many AC-DC sets in community, too much power—or will trade for new Collins 32VI. F. L. Finch, W7HXP, 812 West 4th St., Port Angeles, Wash.

QSLs—America's largest QSL printers. There's a reason. VYS Printers, 1704 Hale Ave., Ft. Wayne, Indiana.

TEMCO 250 GSC XMITTER FOR SALE: 250 watts phone, CW, ICW; 2,000 through 16,000 kc. Complete with mike, most spare tubes, 70 inch fan-cooled cabinet, remote control panel, manual. Operating on 75 meters at W8QKS. Continuously variable master oscillator or crystal controlled. Photos, description on request. $400 f.o.b. Wingard, 3706 Sutherland Road, Shaker Heights, Ohio.

SINGLE SIDEBAND: "Nomographs, Group III, Crystal Filters" designs: lattice, T, and single-element broadband filters with extremely sharp cut-off. Not the familiar receiver type. Full information, one dollar postpaid, guaranteed. Nomographs, Inc., Lawrenceville, N. J.

WANTED: Husky plate transformer, pole type preferred. Also choke. Abell, 82 College, Poughkeepsie, N. Y.

QSL's, SWL's. Attractive cartoons of ham radio. W5FAY Press, 6118 Goliad, Dallas, Texas.

OPEN NIGHTS: (until 9:00) New York—Wednesday. Jamaica—Friday. Harrison has it!

RACK MOUNTED BC-221AK (uncalibrated) with additional amplifiers ending with 6L6 3.5-mc output. Two separate power supplies, one voltage regulated, of finest standard components mounted on individual chassis. Sacrifice complete for $50.00 f.o.b. W2IOP, 1 Ike Place, Woodmere, L. I., N. Y.

"A MODERN RECEIVER for the Beginner." Model unit constructed for article, complete with power supply, ready to go, $20.00 f.o.b. CQ, 342 Madison Ave., N. Y. C.

T23;ARC5 XMITTERS 100-156 mc. auto-tuned. New, never used, with tubes, less crystals—$10. W2GVF, 98 Bodine, Staten Island, N. Y.

FOR SALE: 3" Westinghouse R. F. Ammeter, 0–15 Amps. $3.00. Glass enclosed Westinghouse overload relay type MN adjustable .1 to .4 amps—$5.00. Pair RCA 803's—$30.00. All these are unused JAN parts. Will send list of many other ham parts. Will mail C.O.D. W6YYH, Robert C. Higgins, 420 Diamond St., San Francisco, California.

FOR SALE: 100 watt HT9, perfect condition, with 10–11 meter coils, xtals, extra tubes—$300. New Abbott TR4 with power supply. Price $25. H. B. Pearson, 34 Colonial Court, Brooklyn, N. Y.

SELLING OUT complete kw xmitter and lots of parts. Write for list and price. W9BYN, P. O. Box 389, Kokomo, Ind.

BC-348s. Three, a-c converted. Used but fine shape. Scope aligned and performance like new. $50 each, f.o.b. San Bernardino, Calif. Krentz, 1149 G St., San Bernardino, Calif.

VESTO self-supporting steel towers. No guys. Easily erected. Every ham can afford. Write The Vesto Company, Parkville, Mo.

BEAM CONTROL CABLE. New material. 2 No. 16; 6 No. 20 rubber insulated, coded, tinned conductors. Weatherproof rubber jacket. Heavy overall braided shield. ½" diameter. Value 30c foot. Real buy 11c foot. F.O.B. Chicago. Associated Industries, 6639 Aberdeen Street, Chicago 21, Illinois.

QSLs. Samples for stamp. Henry L. Carter, Jr., W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

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

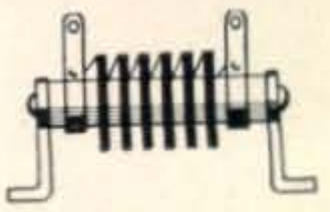
10 METER 3 ELEMENT BEAMS—$19.50. Send card for free information. Riverside Tool Co., Box 87, Riverside, Ill.

SPECIAL CLOSE-OUTS

TRANSFORMERS: 115 Volt primary, insulated 8–9 volt output at 4–8 amperes, $2. Same but 4½, 9, 10, 13½, 19, 20, 24½, 29 and 33½ volts output at 2–5 amperes, $3.50. Same but with 11 taps for 20 to 60 volts at 7–10 ampere output, $6. 3" 24 V AC-DC Monitor Type Edwards Bells, $2. 1/3 HP, 115 V. 60 Cy split (single) phase, reversible, rubber mounted, FH Westinghouse, general purpose, 5/8" shaft motors $27.50. 1/6 HP, 115 V. 60 Cy pipe type blowers made by G-E for ventilating purposes $12.50. 5-point dial switches good for 10–20 amperes complete with handle $1.50. Magnet wire sizes 29–30–31 and 44. Special rectifiers and transformers made to order, high quality, fair prices.

STRICKLAND ELECTRIC CO.
COLUMBUS 11, OHIO

FAMOUS MAKE RF CHOKE
2.5 Milhenrys
500 Ma. DC
BRAND NEW



Six thin universal pies, isolantite, core, insulated mounting brackets. Sensational value at our low price of .. **59c**

PHANTOM ANTENNA
A-27 Sig. Corps

Parts alone worth twice the price! Contains high quality mycalex insulated dual spaced transmitting condenser. 150 mmfd; two heavy duty resistors, pointer knob, scale, leads, and clips. All for only..... **98c**

Nationally Known
" Velvet Action"
VERNIER DIAL

You'll recognize this one! We can't mention name because of terrific low price! Four-inch dial, engine-divided scale and vernier, flush with scale. 5 to 1 planetary drive. Fits ¼" shaft. BRAND NEW, now only..... **$1.69**

HAND REAMER

Every service shop needs this useful tool. Made of solid, high quality tool steel, reams up to ½" hole. DON'T MISS THIS WONDERFUL VALUE. We've only a limited quantity at..... **69c**

SOCKET WRENCH KIT

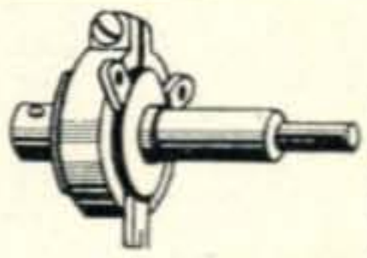
Another necessary tool for every ham, repairman, experimenter. Consists of right-angle ball-bearing wrench, with six interchangeable sockets from ½" down to 3/16". In handy metal container. A REAL BARGAIN AT **35c**

AIR PADDER CONDENSERS

low loss insulated padders, have screw driver adjustment and locking nut. EXCEPTIONAL VALUE! Two types available.

15 mmfd 25 mmfd.

Your Choice TEN FOR **$1.90**



PLANETARY DRIVE
TWO SPEED

Fits condenser shaft back of panel, or dial knob shaft. 5 to 1 and 1 to 1 ratios. For any ¼" shaft. ONLY A FEW LEFT AT THIS LOW PRICE **79c**

No C. O. D.'s under $5.00. Please include postage.
DEPARTMENT 26-G

Federated Purchaser
CABLE: FEDERPURCH
INCORPORATED
distributors of RADIO – ELECTRONIC and SOUND EQUIPMENT
80 PARK PLACE, N. Y. 7
Phone: Digby 9-3050

CQ Ad Index

Allied Radio Corp. 79
Almo Radio Company 107
Alvaradio Supply Co. 108
American Phenolic Corp. 64
American Radio Institute 108
American Surplus Products Co. 77
Arrow Sales, Inc. 98
Barker & Williamson 95
Bliley Electric Company 5
Bud Radio, Inc. 2
Burstein-Applebee Co. 102
Capitol Radio Engineering Institute 80
Cleveland Inst. of Radio Electronics 104
Collins Radio Company 16
Communications Equipment Co. 89
Concord Radio Corp. 87
Continental Sales Company 109
Crest Corporation 109
Decimeter, Inc. 82
Delehanty Institute 109
D & L Electronic Development Co. 105
Eitel-McCullough, Inc. 11
Electronic Corp. of America 93
Electronicraft, Inc. 101
Esege Sales Co., Ltd. 107
Esse Radio Company . . . 66, 67, 68, 69, 70, 71, 72, 73
Fair Radio Sales 92
Federated Purchaser, Inc. 111
General Electric Co. (Tube Div.) 1
General Electric Co. (KenRad Div.) 7
Hallicrafters Company 59
Harrison Radio Corp. 65
Harvey Radio Company, Inc. 85
Harvey-Wells Electronics, Inc. 88
Henry Radio Stores 75
Hytron Radio & Electronics Corp. 9
Instructograph Company 109
Johnson, E. F. Co. 84
Mallory, P. R. & Co., Inc. 8
Measurements Corp. 102
Merit Coil & Transformer Corp. 63
Merit Radio Supply Co. 98
Micamold Radio Corp. 61
Millen, James Mfg. Co., Inc. 6
National Company, Inc. . . . . 57, 62, 78, 105, Cover 3
Petersen Radio Company 12
Power Conversion Corp. 106
Radelco, Inc. 108
RCA (Tube Division) . . . . . Cover 4
Radio Mfg. Engineers, Inc. . . . . Cover 2
Radio Products Sales, Inc. 86
Radio Wire Television, Inc. 90
San Francisco Radio & Supply Co. 108
Schuh's Radio Parts 103
Senco Radio, Inc. 104
Silver, McMurdo Co., Inc. 10
Silverstine, N. Co. 91
Simpson Electric Company 97
Stahl, Michael, Inc. 103
Strickland Electric Company 111
Surplus Radio, Inc. 94
Sylvania Electric Products Inc. 15
TAB 112
Thordarson 14
Universal General Corp. 108
Vesto Company 101
V & H Radio Supply Co. 96
Vickers Electric 92
Webster-Chicago Corp. 4
Wells Sales, Inc. 83
Westchester Electronic Supply Co., Inc. 108
World Radio Laboratories 81

NEVER BEFORE AT ANY PRICE

SUCH VHF VERSATILITY!

THE NEW
NATIONAL HFS
$125
(Power Supply Extra)

Incorporating the latest in VHF design, the new National HFS is ideal for the amateur, laboratories, fire and police departments, news services, airlines and others interested in compact, dependable VHF equipment modestly-priced. Write for complete information.

Complete Coverage 27 mcs-250 mcs!

. . . in 6 bands, including 1¼, 2, 6, 10 and 11 meter amateur bands. Receives CW, AM or FM!

Mobile, Portable or Stationary!

Operates from standard National 5886 power supply, National 686S vibrator power supply or batteries! Built-in speaker. Light.

Receiver or Converter!

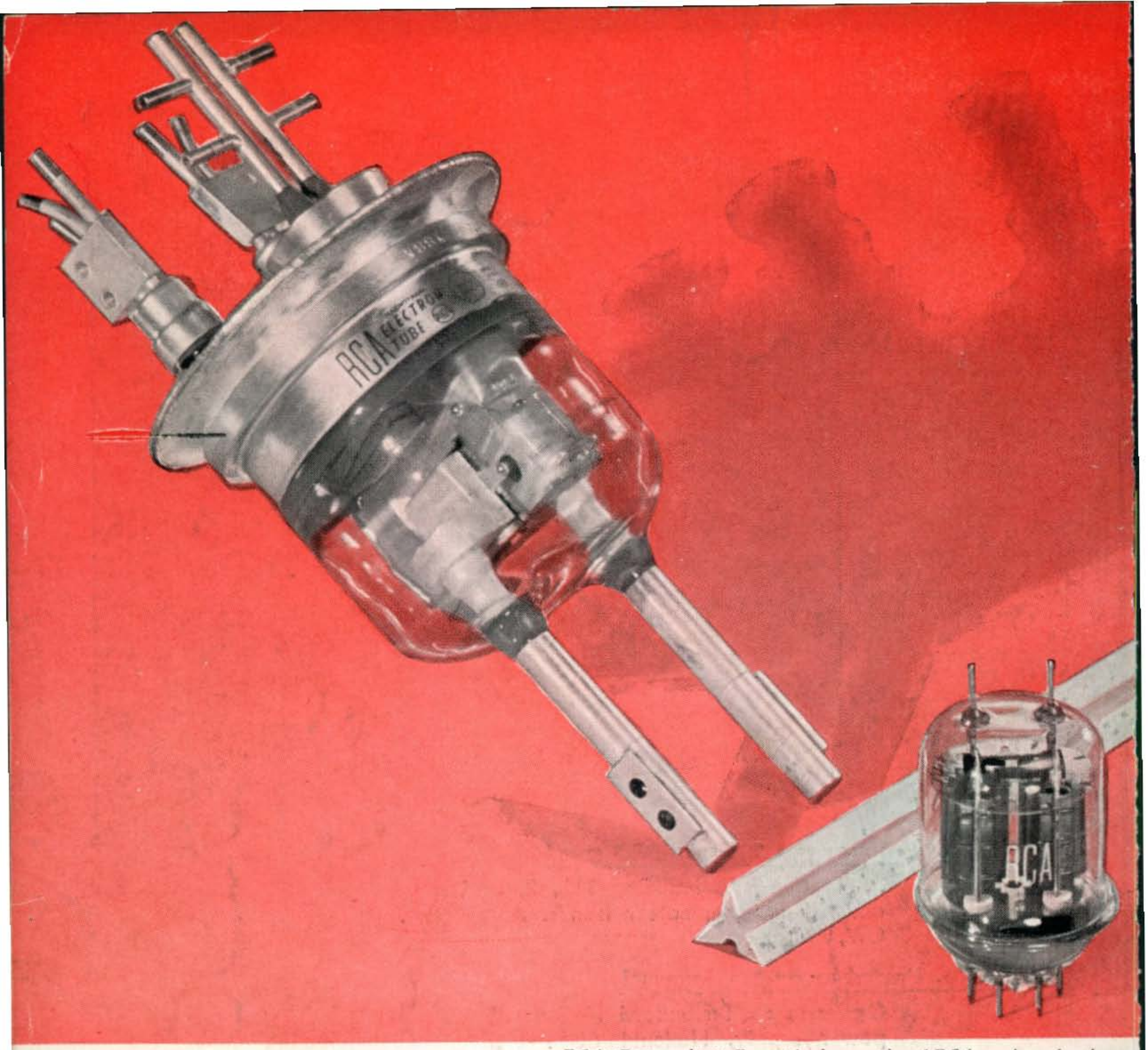
Can be used separately or with any conventional superhet tuning 10.6 mcs. Makes all features of connected receiver usable on VHF!

SEE YOUR NEAREST NATIONAL DEALER LISTED IN THE CLASSIFIED SECTION OF YOUR 'PHONE BOOK.

National

© EST. 1914

NATIONAL COMPANY, Inc.
MALDEN, MASSACHUSETTS



RCA 8D21 and 829-B—typical examples of RCA engineering ingen

In tubes, high efficiency counts ...and RCA tubes have it

• For instance, take the RCA-8D21 and RCA 829-B VHF power tubes—

You can hold the RCA-8D21 twin tetrode in one hand . . . yet this tube takes a *full 10 kw input right up to 300 Mc!* The answer? Water is piped right into the electrodes . . . each electrode is cooled *close to its active area.* What's more, the incorporation of advanced principles of "electron optics" and electrode screening give the RCA-8D21 exceedingly high power sensitivity and unusual stability as a *wide-band* final amplifier in television and FM transmitters.

The same caliber of engineering ingenuity is i corporated in the tiny RCA 829-B. This twi beam tube for amateur work takes 150 wa input at 200 Mc . . . and can be driven by 2E26 doubler!

To get maximum efficiency from the tubes y pay for, buy RCA. For full information on a RCA tube, see your local RCA Tube Distribut or write RCA, Commercial Engineering, Secti DM-39 Harrison, New Jersey.

The Fountainhead of Modern Tube Development is RC

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.