MAY
1956
50c

CQ

RADIO AMATEURS' JOURNAL

the S-9'er----

Why this rig is a soun Financial Investment

The advanced design and careful craftsmanship in Collins S equipment naturally result in a high, lasting value on the mark After years of top performance, an important part of the purcha price will be returned to you as trade-in value. You'll be surpris at the low cost per day.

A Collins SSB rig *is* a sound financial investment. You can nc purchase this superior equipment on a convenient Time Payme Plan and operate while you pay. See your distributor for comple details.

Collins CREATIVE LEADER IN COMMUNICATION

Popularity of Aluminized Picture Tube rewards many years' development work by W2RDC!

RADIO amateur Von C. Campbell of General Electric helped develop the first successful aluminized picture tube more than a dozen years ago. Viewers owe much of their enjoyment of daylight-bright TV to W2RDC.

Over a span of many busy years, Campbell has worked to make the aluminum-backed screen grow from idea to universally accepted means of improving picture brightness and contrast.

When he isn't serving in his dual General Electric capacity of C-R Tube product planning manager and advanced-process engineering executive, Campbell goes on the air to keep warm his contacts with hams from coast to coast and overseas. 10-meter phone transmission gives him a wide-ranging signal, though in the past he also has worked 40 meters CW and 2 meters phone. TV in his ham shack? Well, muses Campbell, the day may come . . . !

Alertness to new concepts and methods—the desire to improve, to make more efficient—these traits of the radio amateur are valued highly by General Electric, contribute to the design and manufacture of tubes of all types sold by your G-E distributor. Install G-E tubes with confidence! Ham know-how helps make them *good* tubes. *Tube Department, General Electric Company, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

166-183

Vol. 12, No. 5 **CQ, The Radio Amateurs' Journal** May, 1956

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HEATHKIT

DX-100

PHONE AND CW

transmitter

KIT

FEATURES

Design proven through actual signal reports.

★

Only top-quality components used throughout.

★

5-point TVI suppression, and pi network output to match 50 to 600 ohms.

★

Detailed construction manual for simplified assembly.

★

100 watts output on 160, 80, 40, 20, 15, 11, and 10 meters.

★

Attractive and functional physical design.

The Heathkit Model DX-100 Transmitter is rapidly becoming the "standard" ham rig in its power class. The high quality and outstanding performance it offers can be matched only in equipment costing many dollars more. It features a built-in VFO, modulator, and power supplies, and is bandswitching for phone or CW operation on 160, 80, 40, 20, 15, 11, and 10 meters. The kit includes a detailed construction manual, the cabinet, all tubes, prewound coils, and all other parts necessary for construction.

Push-pull 1625 tubes are used to modulate parallel 6164 tubes for RF output in excess of 100 watts on phone, and 120 watts on CW. May be excited from the built-in VFO or from crystals. Features pi network output circuit, illuminated VFO dial and meter face, and 5-point TVI suppression. High grade, well-rated parts supplied. Schematic diagram and technical specifications on request.

MODEL DX-100

$189.50

Shpg. Wt. 107 Lbs.

Shipped Motor Freight unless otherwise specified. $50.00 deposit required on all C.O.D. orders.

HEATHKIT

antenna coupler

KIT

MODEL AC-1

$14.50

Shpg. Wt. 4 Lbs.

In addition to matching a low power transmitter to an end-fed long wire antenna, this antenna coupler incorporates a 3-section low-pass filter, to attenuate output above 36 mc and reduce TVI. Handles up to 75 watts, 10 through 80 meters. 52 ohm coaxial input—tapped inductor and variable capacitor—neon RF indicator. Ideal for use with the Heathkit AT-1 Transmitter.

HEATHKIT

grid dip meter KIT

The Model GD-1B is a time-proven instrument. It will enable you to accomplish literally hundreds of jobs on all types of equipment. Frequency range is from 2 mc to 250 mc. A 500 ua meter is employed for indication, and a sensitivity control and headphone jack are provided. Includes pre-wound coils and rack. Indispensable for the ham, serviceman, and engineer. Extra coils available to extend frequency down to 350 kc.

MODEL GD-1B **$19.50**

Shpg. Wt. 4 Lbs.

HEATHKIT

antenna impedance meter KIT

Used with an RF signal source, the AM-1 will enable you to match your antenna-receiver-transmitter system for optimum operation. Will double as a phone monitor or relative field strength meter. Uses 100 ua meter, and covers 0 to 600 ohms. Frequency to 150 mc.

MODEL AM-1

$14.50

Shpg. Wt. 2 Lbs.

HEATH COMPANY

A Subsidiary of Daystrom, Inc.

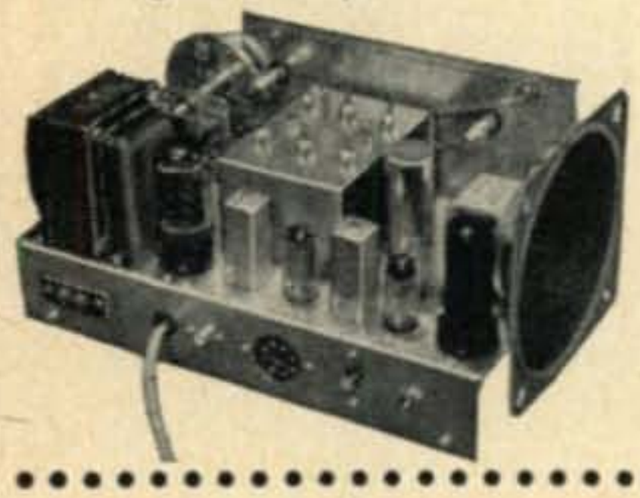
BENTON HARBOR 12, MICHIGAN

HEATHKIT communications-type all band receiver KIT

Slide-rule dial —electrical bandspread—ham bands marked.

Slug-tuned coils and efficient IF transformers for good sensitivity and selectivity.

Transformer-operated power supply for safety and high efficiency.



The Model AR-3 receiver features new high-Q slug-tuned coils, new layout, and new-type IF transformers. The result is high sensitivity and selectivity and better image rejection on all bands.

Transformer-type power supply, electrical bandspread, RF and AF gain controls, antenna trimmer, AGC, BFO, headphone jacks, socket for Q multiplier, 5½" PM speaker and illuminated dial.

SPECIFICATIONS:

Frequency Range—550 kc to 30 mc on four bands.
Tube Complement—1—12BE6 oscillator and mixer • 1—12BA6 IF amplifier • 1—12BA6 second detector, AVC, first audio amplifier and reflex BFO • 1—12A6 beam power output • 1—5Y3 full wave rectifier

$27.95 *(Less Cabinet)*
MODEL AR-3
Shpg. Wt. 12 Lbs.

CABINET: Fabric-covered cabinet available. Includes aluminum panel, speaker grille, and protective rubber feet. Measures 12¼" W. x 6¼" H. x 7¼" D. No. 91-15. Shpg. Wt. 5 Lbs. **$4.50.**

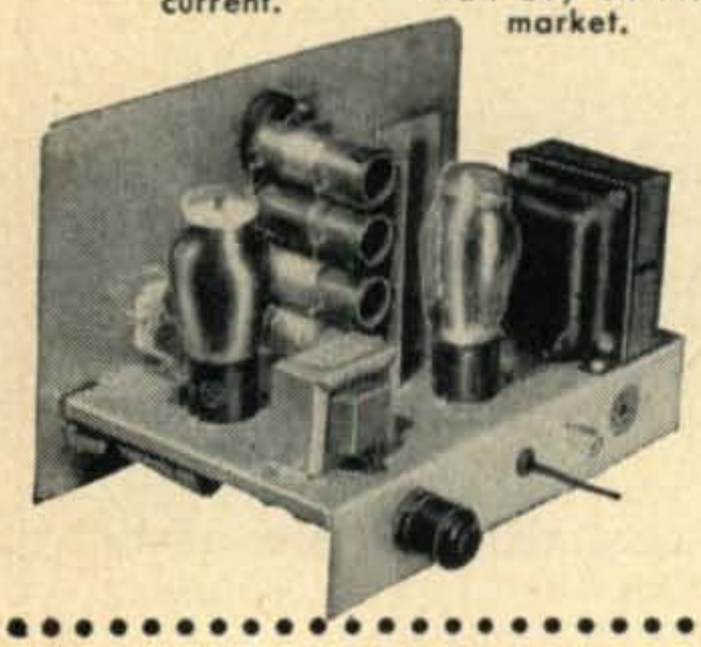
HEATHKIT CW amateur transmitter KIT

Single-knob bandswitching for 80, 40, 20, 15, 11, and 10 meters.

Panel meter monitors final grid or plate current.

Plate power input 25-30 watts.

Best dollar-per-watt buy on the market.



The AT-1 is complete with its own power supply, and covers 80, 40, 20, 15, 11, and 10 meters with single-knob bandswitching. Designed for crystal or external VFO excitation. Incorporates key-click filter, line filter, copper plated chassis, pre-wound coils, 52-ohm coaxial output, panel meter, and high quality components throughout. Easy to build, even for the beginner. Employs 6AG7 oscillator and 6L6 final. Up to 30 watts power input.

$29.50
MODEL AT-1
Shpg. Wt. 15 Lbs.

SPECIFICATIONS:

RF Amplifier Power Input	25-30 watts
Output Connection	52 ohms
Band Coverage	80, 40, 20, 15, 11, 10 Meters
Tube Complement:	
5U4G	Rectifier
6AG7	Oscillator—Multiplier
6L6	Amplifier—Doubler

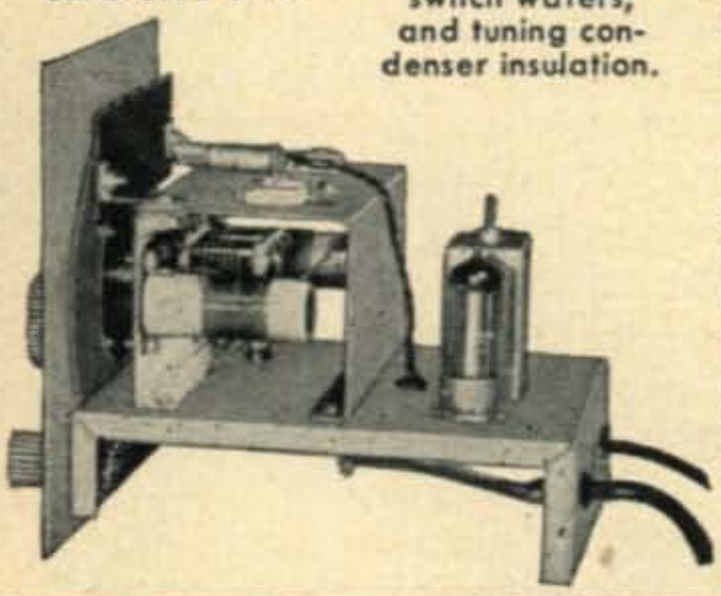
OA2 voltage regulator tube for stability.

Covers 160-80-40-20-15-11-10 meters.

Smooth-acting, illuminated and pre-calibrated dial.

6AU6 electron-coupled Clapp oscillator.

Copper plated chassis—aluminum case—profuse shielding—ceramic coil forms, switch wafers, and tuning condenser insulation.



HEATHKIT vfo KIT

The Model VF-1 features illuminated and pre-calibrated dial scale. Cable and plug provided to fit the crystal socket of any modern transmitter. Covers 160-80-40-20-15-11 and 10 meters with 3 basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Derives operating power from transmitter power supply. Has VR tube for stability. Go VFO for more operating enjoyment.

MODEL VF-1

$19.50

Shpg. Wt. 7 Lbs.

SPECIFICATIONS:

Output Frequencies—1750-2000 kc, 7000-7425 kc, 6740-6808 kc. **Calibrated Bands**—160-80-40-20-15-11-10 meters. **Tube Compliment**—6AU6 Oscillator OA2 Voltage Regulator. **Power Requirements**—250-350 VDC @ 15-20 ma. and 6.3 VAC @ .45 A.

ORDER DIRECT FROM THIS AD . . . OR WRITE FOR FREE CATALOG. Describes more than 65 interesting "build-it-yourself" projects. Amateur equipment, hi fi amplifiers, and the complete Heathkit line of test instruments. Get yours today!

HEATH COMPANY
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 12, MICHIGAN

Feenix, Ariz.

Deer Hon Ed:

Are you knowing that statisticks showing that one-half of all married peeples are women? This are most surprizing to me—what I can't figyouring out is why perfectly sensible, happy, contented men are marrying women—espesh-youally amchoors men.

As you are no doubtless seeing by now, Scratchi are having big 1/c problum with Lil, my XYL-to-be. It isn't that I minding going half-way with her, no indeedy. It's just that I not liking to be taken hook, line, sinker and bait.

Like taking last week (and speaking of taking last week, I wishing sumbuddy had). I had decided I had had enuff of Lil's poverty program. As you recalling, she insisting I not spending any money on amchoor radio until having enuff bux to buying to pound dyemond wedding ring.

So Scratchi sitting, and thinking, and sitting and thinking. I reelizing that Lil are never letting me spend money on a new reseever while she conchus. And that are when the idea are striking. Of course, if Lil not letting me do it when she are conshus, well, then, why not hipnotize her!!

A quick trip to Hon. Library for books, a cupple afternoons reeding like furies, and I are all set. A reel slicky idea, you not thinking? You not understanding? Here are the pitch, which are called post-hipnotic suggestshun.

You putting subject (that's Lil) in trance, then telling them next day to going to store and buying something. When they coming out of trance, they not remembering what you telling them, at the moment, but next day they going to store and doing what you telling them!! Good old geenyus Scratchi. When slicker stunts are being slickered, old slicky Scratchi will be figyouring them out!!

That nite Lil are coming over to the ranch. I having everything all arranged. Comfortable chair, soft lites, sweet music, insense burning. Hon. Ed., it are the most. We are all alone, on acct. Hon. Brother Itchi are out for the

[*Continued on page 8*]

22 years experience guarantees the best in every price range

model SX-100
AM-CW-SSB
receiver
$295.00

"Tee-Notch" Filter provides a stable non-regenerative system for the rejection of unwanted heterodyne in SSB. The "Tee-Notch" also produces an effective steepening of the already excellent 50 mc i-f pass band. Upper or lower side band selectable by front panel switch. Notch depth control for maximum null adjustment. Antenna trimmer. Plug-in laboratory type evacuated 100 kc. quartz crystal calibrator—included in price. Second conversion oscillator crystal controlled—greater stability through crystal control and additional temperature compensation of high frequency oscillator circuits.

model HT-30
AM-CW-SSB
transmitter/
exciter
$495.00

Built in V.F.O. reads directly in kilocycles. V.F.O. stability is equal to most crystals—.009%. There are also provisions for 1 crystal for fixed frequency operation. Selective filter system is same used by commercial communications companies for reliable sideband selection to assure continued suppression of unwanted side band energy (down 40 db or more) and distortion products. New 50 db range meter for constant monitoring of r-f output and carrier suppression. Voice control system built in with adjustable delay and anti-trip features. Front panel controls allow selection of AM, CW, and upper or lower side band.

model HT-31
AM-CW-SSB
linear power
amplifier
$395.00

Continuous frequency coverage from 3.5 mc to 30 mc. Pi-network output for efficient harmonic and T.V.I. suppression. Major T.V.I. suppression built in. Does not require an antenna tuner as will feed loads from 50 to 600 ohms. Full metering of all important circuits, including input in watts. Employs two 811-A zero bias triodes in parallel. The input system is designed to be fed from a 50-70 ohm unbalanced line and requires a maximum of 10 watts drive on 80 meters. The grid tank circuit is balanced to provide all band neutralization.

hallicrafters

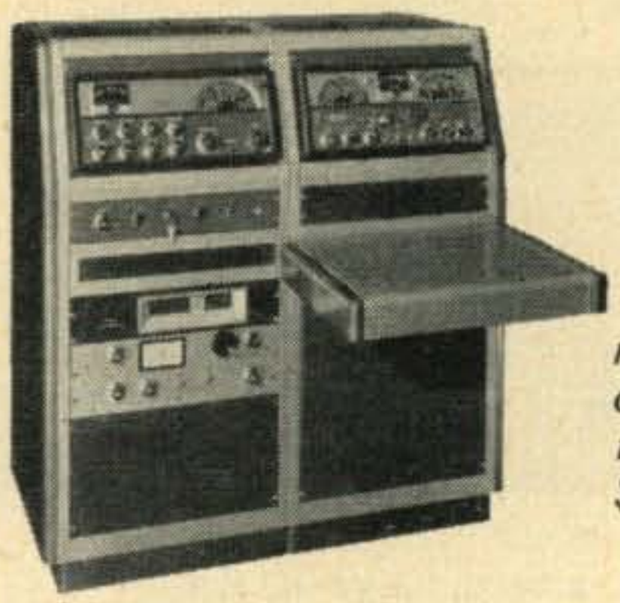
Chicago 24, Illinois

model SX-96
AM-CW-SSB
double conversion
selectable
side band receiver
$249.95

Precision gear drives are used on both main tuning and band spread dials. Double conversion with selectable crystal controlled second oscillators. Selectable side band reception of both suppressed carrier and full carrier transmissions by front panel switch, delayed AVC, CW operation with AVC on or off. Has calibrated bandspread. Double conversion superheterodyne over the entire frequency range. Automatic noise limiter operated from front panel. Carrier level indicator calibrated in "S" units from 1 to 9, decibels to 90 db over S9, microvolts from 1 to 1000 K.

model SX-99
AM-CW receiver
$149.95

Over 1000° of calibrated bandspread over the 10, 11, 15, 20, 40 and 80 meter amateur bands on easy-to-read dial. Separate bandspread tuning condenser, crystal filter, antenna trimmer, "S" meter, one r-f, two i-f stages and new styling. Complete front panel controls: antenna tuning, sensitivity, band selector, main tuning, bandspread tuning, volume, tone, standby, selectivity, crystal phasing, noise limiter.



model SR-500
complete amateur
radio station
$1495.00

A complete radio station in a handsome console cabinet—transmitter/exciter, linear power amplifier, receiver—affording the finest in V.F.O. or crystal. SSB, AM and CW transmission and reception. You need supply only the antenna, microphone and AC power. All the wiring is complete, and external connections are provided for antenna and microphone. A special communications speaker is positioned above the operating shelf. Console is mounted on casters. Three blank panels provide for installation of additional equipment.

[from page 6]

evening, so Lil and I just sitting and talking for awhile. After while I seeing Lil eyes getting hevvy, so I getting close to her, telling her to look in my eyes, that she are getting very sleepy, sleepy, sleepy.

Hon. Ed., it working! There she are, just as nice and hipnotized as could be. After I making sure, I giving Lil detaled instruckshuns. I telling her I putting money for reseever in her purse. I telling her I wanting the Acme HF-1 Sooperhet, which are on sale, demonstrator model, at Happy Hap's Used Reseever Emporium on Sixth Avenew.

Lastly I telling her she not remembering anything I saying when she waking up, but she going downtown and bying reseever next day. Then, I snapping Hon. Finger, and Lil are waking up. She saying she sorry she falling asleep on me, and maybe she better going home.

Next day I are getting up brite and erly. I can hardly waiting for Lil to driving up to ranch with my new reseever! And you thinking I having long time to wait? No indeedy. It are little past eleven o'clock when I heering car in driveway, and running to window to peeking out. Hackensake!! it are Lil's car!!

I going into living room so as to apeering I not knowing what going on. Lil coming in front door, and into living room. Hon. Ed., she not carrying anything—oh, maybe it so hevvy she leeving it in car.

Lil sitting down like nothing happening, so I asking her how comes she visiting so erly in day. She answering that she been out doing some shopping (hah!). So I asking what she shopping for, and she saying she buying something she thinking I liking (AHA!). So, with smile in my voice, I asking her to letting me see it.

And that, Hon. Ed., are when she are stabbing me. She standing up, unbuttoning her coat, and asking me how I liking her new dress. NEW DRESS!! In shakey voice I asking howcomes she suddinly having all that money. You know what she saying? She telling me she finding wad of money in her purse, so she desiding it must be the money she praying for for new dress.

Hon. Ed., don't you thinking that takes the icing off the cake? What went wrong. Was she hipnotized but hipnotism not working? Was she just pretending she hipnotized so she gtting all my bux? Or did hipnotizing work only she not remembering next day to bying reseever?

If you getting any grate ideas letting me know, and I'll start putting more pennies away for new reseever.

Respectively yours,
Hashafisti Scratchi

Heart of the modern 2 meter transmitter— Eimac's 4X250B

TYPICAL OPERATION

4X250B Radial-Beam Power Tetrode

(Frequencies to 175mc per tube)

	Class-C CW or FM Phone	Class AB_1 RF Linear
D-C Plate Voltage	2000v	2000v
D-C Screen Voltage	250v	350v
D-C Grid Voltage	—90v	—50v
D-C Plate Current	250ma	250ma*
Zero Sig D-C Plate Current	—	100ma
D-C Screen Current	25ma	15ma*
Peak RF Grid Voltage	115v	50v*
Driving Power	2.8w	0w
Plate Power Input	500w	500w*
Plate Power Output	410w	325w*

*Max Signal

Amateur pioneer, Frank C. Jones, W6AJF, uses two Eimac 4X250B's in his new 2 meter transmitter.

Frank, who was founder of the Radio Handbook and Radio Magazine, has been a leading figure in amateur radio for 35 years. In 1923 he and John Reinartz, K6BJ, were the first to establish one-way contact across the United States on 20 meters. Frank's prime interest is now VHF, and from his Sonoma, California home he has logged over 950 stations on 2 meters, and has won the San Francisco Section title in the last 22 consecutive ARRL VHF contests.

Discover for yourself why Frank is using Eimac 4X250B's in his 2 meter rig. Already the outstanding new tube in modern, lower frequency transmitters, they are today's easiest approach to a compact, one-kilowatt transmitter at 2 meters. They offer simple circuit design, low driving requirements, stability.

Build *your* new transmitter around these rugged, reliable new tubes.

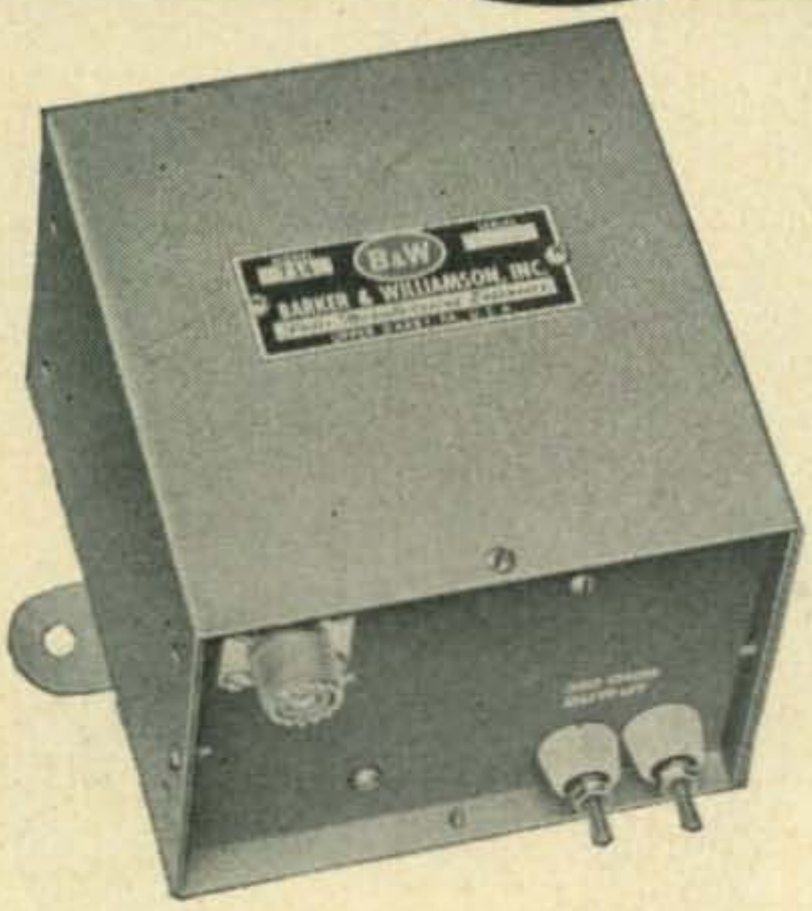
For further information on the 4X250B, contact Eimac's Amateur Service Bureau or visit your Eimac distributor.

EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA

The World's Largest Manufacturer of Transmitting Tubes

QUALITY PRODUCTS BY B&W



1 KW BALUNS

Husky B&W 1 KW baluns fill the gap between unbalanced feed lines and balanced antenna loads by accurately matching low impedance unbalanced transmitter outputs to rotary beam or folded dipole antennas. These baluns provide maximum transfer of power, low line radiation on transmission, and high signal-to-noise ratio on reception.

Net price: All single band beam and folded dipole baluns.....$16.50

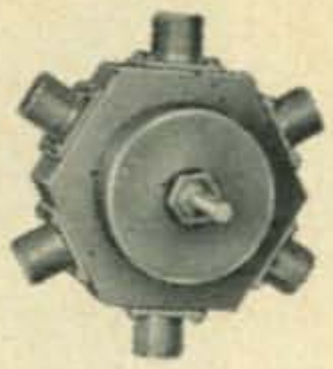
MATCHMASTER

Three valuable instruments in one, the Matchmaster can be used as a dummy load, direct-reading r-f wattmeter, and an integral SWR bridge, for fast measurements on coaxial feed lines, antennas, and transmitting equipment.

Net Price { Model 650 for 52 ohm line / Model 651 for 73 ohm line } $47.50

ALL OF THESE FINE B&W products are available at leading distributors' everywhere.

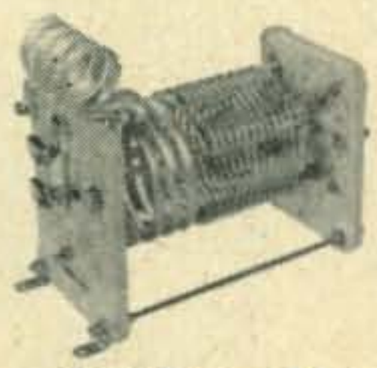
COAXIAL SWITCHES



Model 550-A permits instant selection of any one of five 52 or 75 ohm lines. Model 551-A is a 2-pole, 2-position type used for switching various devices in or out of series connection with coax lines.

Net Price { Model 550-A.....$8.25 / Model 551-A.....$7.95

1 KW PI-NETWORK TANK COIL



A high-power integral bandswitched pi-network tank coil for maximum efficiency from 80 through 10 meters. For Class "C" or linear operation. Minimum "Q" of 300 over entire operating range.

Net Price: Model 850..... $35.00

SINGLE SIDEBAND GENERATOR

The 51SB generator offers sparkling SSB performance with your present B&W, Collins, Johnson, or other commercial or composite home built transmitter, on 80 through 10 meters with the output frequency control presently in your transmitter.

Net Price: Model 51SB.....$279.50

CERAMIC PLUG AND JACK BARS

Carefully made steatite materials provide experimenter with same units used on B&W inductors. Strength and rigidity also make them useful as spreaders for feeders and other parts of the antenna system.

Net prices range from.....$.24 to $1.35

WATCH FOR the big value announcement on B&W's new L-1000A 1 KW Single Sideband Linear Amplifier!

All prices subject to change without notice.

Barker & Williamson, Inc.

237 Fairfield Ave., Upper Darby, Pa.

EDITORIAL
WAYNE GREEN

. . . de W2NSD

NEVER SAY DIE

You didn't really want another Special Mobile Issue of *CQ* this May, did you? You can figure out most of the pro's and con's on your own time, but the really deciding factor was our wish to keep a balanced format. Isn't this better than saving up all of the mobile articles for release at one time?

The Traveling Editor

I've been tied down at home in Brooklyn for most of the last month. The main project has been the reconstruction of the ham shack. Reconstruction was sorely needed too. Being the victim of the sort of psychosis which manifests itself in the buying of equipment whenever it is a bargain, I have naturally demonstrated a talent for filling up any given space, no matter how large. Couple this with a subsidiary quirk which prevents my selling or giving away anything and compound the interest for a twenty-year period. The only reason that I have only filled the attic, cellar and garage is that I was painfully short of cash during the heyday of surplus.

When the shack in the cellar got so full that I had to hook up a remote control for the transmitter and operate from the living room it was obviously time for a change. Investigation of metal drawers and shelves used by industry showed that they were really quite an inexpensive way of handling the problem. I invested in three of the 33-drawer storage cabinets (which run about $1 per drawer total) and hold more than two cigar boxes full of parts per drawer. This released two to three hundred cigar boxes for the local kids to take home.

This took care of the small parts, but the bigger lumps still needed attention. I invested in seven of those six-foot steel shelves (about $15 each in the 18″ depth by 36″ wide). At first I started to use these just for storage, but after setting up some of the smaller units for operation I changed my mind and put everything that wasn't rack mounted on these shelves and hooked up the power and antenna wires. These shelves make an ideal operating position when you have a lot of small separate units.

Each unit has six shelves. I use the top one for storage of test equipment. The next one holds an SX-28, spare receiver in case anything happens to the NC-300. Also up there are the antenna rotators. The Panadaptor and sideband adapter for the SX-28 fill out that shelf. Next down are the a-c power distribution panel, the Gonset Communicator and Linear, the Lakeshore Phasemaster II and BC-458 v.f.o. The next shelf has the NC-300 with its speaker and converters, the Harvey-Wells Bandmaster T-90 Transmitter and Power Supply and the Harvey-Wells Z-Match. The bottom shelf is mostly for storage of more test equipment, though I do have a 'scope hooked up there for action.

It would have been difficult to figure any sort of operating desk or table to hold all of these small unrackmountable units. Just two units of the shelving holds the whole works and makes a very neat looking shack.

Pentone System

Fred Albertson, W3FMC, stopped by the other day and launched an explanation of some new RTTY systems that he and some cohorts have been developing. One, the Pentone System, looks like a real comer for amateur use. One of the major drawbacks of the present RTTY system is the reliance upon synchronism. Since the five selecting pulses are sent in time sequence, strict sync must be maintained. Fred proposed sending five different tones simultaneously. This would have important application not only on the low frequencies as an important step toward fighting fading and QRM but would be the first solution to date for the VHF problem of communication via meteor reflection. More and more VHF'ers are going to high power, big beams, and skeds to push the area of marginal communication further. Meteors allow the signal to be bounced in every now and then, but so far all that could be transmitted was a carrier. CW and phone can't work when all you get is a fraction of a second of reception every minute or so.

The setup could be all-automatic, too. A short listen on the band to the carrier of the station you want to work would give you an idea of the time between meteor reflections. A simple RTTY tape setup with a timer would send out each letter for a prescribed time and then advance the tape to the next letter and send it. I would incline toward gilding the lily by using 80 Meters for verification of reception of a character by having the receiving station repeat whatever he receives on 80 automatically and have the sending station connect his printer to the 80-meter receiver. Thus when

he typed a letter he would not see it printed on his page until the signal had gone out and back. I used to do this between Brooklyn and Larchmont and found it to be a lot of fun. In that way, whoever is typing is copied by both stations but gets his own copy only after being retransmitted through the other station.

RTTY Dinner

The second annual dinner was held during the IRE Show in New York in March. Despite the worst snow storm in ten years which marooned quite a few of the New York and New Jersey gang, there were 38 present. A fuller report will no doubt turn up in the RTTY column so I won't go into who was there, etc. With the large-scale appearance of the newer printers at very reasonable prices there has been a swift upsurge in interest in this newest branch of our hobby.

SSB Dinner

Over 300 turned out for the sixth annual conclave. There were prizes galore. The prize committee must have really put the pressure on the manufacturers to come up with such a pile of loot. I didn't win anything, as usual. There was so much rag chewing going on that few noticed how good the dinner was. Some prety good DX turned up and I had a chance to meet Wayne, HR2WC in person after having QSO'd him on SSB a few days before.

North Penn Static

My particular thanks goes to the North Penn Radio Club and their club bulletin the "Static" for giving our VHF Contest a plug therein. This bulletin, edited by W3YWW of Doylestown, runs quite a bit of VHF news and keeps members up to date on their own WAS contest on 40 Meters.

Cue Our Mary

Now and then you hear something on the air that is worth reporting. Here is a good one: A W9 was in QSO with a W2 and he mentioned that he had been asked to make a phone patch the other day by a fellow in the Virgin Islands. It seems that the wife and kids of another ham had gone down there on vacation and he was supposed to follow. They wanted to call him to see if he had left yet.

The phone patch was initiated and while the operator was trying to get the number, the wife of the W9 got on the upstairs extension and pretended to answer the phone. She said she was the fellow's girl friend and that she would call him to the phone. At this moment the band changed and the KV4 lost the W9 so explanations were impossible. He sort of wonders how the fellow is going to explain this to his wife when he gets down there.

$\frac{(2^2 \times 3)^2 + 2}{2}$, Wayne W2NSD

The features you want are now EASY TO OWN

Completely New

RME Electro-Voice® 4300 RECEIVER

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$194

Operator-Designed and Laboratory-Engineered for Amateur Communications

High Selectivity and Rejectivity
Precisely tunes the signals you want, even at high frequencies. Rejects unwanted signals and undesirable noise.

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Unique two-speed control knob provides smoother, accurate tuning and scanning.

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Highly stable components and construction prevent frequency shift or drift.

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Heavy steel chassis, cast aluminum panel and rugged steel cabinet assure stable, long-life service.

This completely new receiver includes many deluxe features usually found only in higher priced models. It provides injection control of the beat frequency oscillator. Particularly useful for CW and SSB reception.

Large, evenly graduated, illuminated dial covers all six amateur bands from 1.76 mc to 29.8 mc (160 thru 10 meters). Unique differential 75:1 or 1:1 ratio tuning control. Plates in tuning condenser are triple-spaced to reduce drift and microphonics. Selectivity control with four positions. IF curve is 2.8 kc wide without crystal filter, attenuation 60 db down at 7 kc above or below the desired frequency. Crystal filter has phasing control for variable rejection of unwanted adjacent signals. Excellent image rejection. High sensitivity of 2 microvolts for 10 db signal-to-noise ratio. Temperature-compensated. Drift is negligible after 20-minute warm-up. Extreme stability permits single sideband reception with or without adapter. ANL. Antenna trimmer permits peak adjustment. 4-position function switch. Two coaxial jacks for SSB adapter. 4-ohm speaker terminals. Transmitter relay control.

Controls include: Dual-speed tuning, AF gain, BFO pitch, BFO injection, antenna trimmer, calibration adjust, band selector, RF gain on-off, function switch, 3-position receive—standby—transmit switch, 4-position crystal selectivity control, crystal phasing-rejector control, ANL. Size: 10 in. high, 16½ in. wide, 10 in. deep. Finished in attractive instrument-gray. 117 volts, 50-60 cycle AC.

To own the 4300 means more QSO's!
See your EV-RME distributor or write for Bulletin No. 240-C65.

MODEL 4301 SIDEBAND DETECTOR-SELECTOR

New RME 4301 provides easy-to-tune, stable SSB reception of both carrier present and carrier suppressed types. Plugs directly into the RME Model 4300 receiver or easily connects between IF and audio stages in any other communications receiver. Built-in power supply. Size: 10 in. high, 8½ in. wide, 10 in. deep. **Net $75.00**

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BUCHANAN, MICHIGAN

Letters . . . to the editor

Wayne Green, W2NSD
Editor, "CQ" Magazine
67 West 44th Street
New York 36, N.Y.

Dear Mr. Green:

As you know, the Sixth Annual Single Sideband Dinner, held on March 20th at the Hotel Shelburne, New York City, was attended by over 300 "sidebanders." The purpose of these yearly affairs is to bring SSB out of town boys who attend the IRE Convention together with the East Coast SSB group, to have a "personal QSO" and an all around good time! Likewise, it is a means for the various manufacturers and dealers to exhibit their latest SSB equipment and arrange a "direct contact" between maker and user.

This year the response and cooperation of these manufacturers and dealers in exhibiting their products and their participation towards door prize awards was indeed very gratifying. Many fellows thought it would be a good idea to know "who was there and etc" and I personally would like to take this opportunity through your column "Letters to the Editor" to thank each and every manufacturer and dealer who helped make this affair the success that it was, for the display of his products and his contribution of door prizes.

Particularly, I want to express the appreciation of all the SSB boys to W9DYV of Central Electronics for donating a 600L Broadband Linear Amplifier. Unfortunately, however, their high hopes of winning it went way down below "mud bottom" as it was drawn and accepted by W2AVA of Harrison Radio, New York City.

It might be of interest to know the following firms supported our "miniature hamfest," the figures in brackets being donations:—

Central Electronics	(400)	Frederick Tool & Engr. Co.	(25)
Barker-Williamson	(135)	Raytheon	(25)
Gonset Co.	(125)	Harvey Radio	(75)
Hallicrafters	(135)	Toegel Electronics-W2LI	(25)
Hudson Radio	(75)	"CQ"	(25)
Eldico	(50)	"ARRL"	(10)
Radio Specialties	(50)	Industrial Electronics-Boston	(25)
Peterson Radio	(50)	Lakeshore Industries	(20)
Burnell & Co.	(35)	Harrison Radio	(25)
Collins Radio	(35)	Ft. Orange Dist. Co.	(10)
Arrow Electronics	(100)		

Also: W2HYV-W2EWL-W3KET-K2FZ-W2AMB

I am sure I speak for everyone in attendance that "a good time was had by all" and it is hoped we can do it again next year.

Fred Huff, W2AMB
Jackson Heights, N. Y.

Sunspots

Dear Editor:

As one studying Sunspot Numbers, I noticed in "Predictions of Sunspot Numbers" by A. F. McNish & J. V. Lincoln, TRANSACTIONS, Amer. Geophysical Union, V. 30, No. 5, Oct. '49, an awesome probability. They have redrawn the first 17 cycles in year-bar graphs, timing 12 months from the minimum between cycles, rather than on the usual calendar years.

In sketching in cycle 18 and the current part of cycle 19, in their manner, the observation is striking in that cycles, 16, 17 and 18 resemble cycles 1, 2 and 3. Recent predictions of cycle 19 have been that it would be extreme. The historical record also shows cycle 4 is the most massive on this style of graph. Will cycle 19 follow this pattern and resemble cycle 4? No other pairing, however mixed, of these bar graphs of the known 19 cycles carries such resemblances.

Roughly, DX is easiest at 40 Meters when sunspot numbers are under 10, at 20 Meters when numbers are 10 to 30, at 15 Meters when from 30 to 60, and at 10 Meters when over 60 sunspot numbers.

Cycle 4 averaged 60 numbers or over for 7 years. Cycles 5 and 6 *never* averaged over 50. They are the

[*Continued on page 16*]

Small, highly efficient

MOBILE RECEIVER

—full fledged, 12 tube, all-band, mobile or fixed station

Power Packs Available:

6-12 VDC
12 VDC
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** (includes speaker and "S" meter all in one matching package)*

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now delivering
5" High, 6" Wide,
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- Field performance fully comparable to big table models.
- 7-band turret, 10 meters thru broadcast.
- New, advanced noise elimination circuits.
- Dual conversion, crystal controlled.
- Pulls in and holds weak stations.
- 3 KC selectivity, under 1 microvolt sensitivity.

You asked for it . . . here it is:

New MARS frequency coverage on all standard amateur models— at no additional cost

Band #1	**550**	**—**	**1700 KC**
Band #2	**1700**	**—**	**3500 KC**
Band #3	**3500**	**—**	**4030 KC**
Band #4	**6990**	**—**	**7310 KC**
Band #5	**13975**	**—**	**14360 KC**
Band #6	**20990**	**—**	**21450 KC**
Band #7	**27990**	**—**	**30000 KC**

Watch for announcement of our new matching transmitter — REVOLUTIONARY!!

PIERSON-HOLT ELECTRONICS

2308 West Washington Blvd., Venice, California

Write for literature

[from page 14]

smallest 2 cycles on record. In fact, over 36 years passed before the annual average again reached 60! A whole 7 years went by with the annual average less than 15 numbers. This was like the period of Sept. '53 to Jan. '54. The year 1951 averaged 63 numbers.

Thus, if the resemblances continue, ten-meter openings should be rather steady through 1962; but after 1964 they may be very few and rather brief, until about . . . 1999!

From other graphic analyses, figures of not later than 1953 indicated that the low between cycles 18 and 19 had to be May, '54. Similar but much less positive indications now can be interpreted to show a several-months' minor "high"or "low" for about June at approximately 86 or 120 numbers. Graphically, there also appears to be a few months' minor "low" coming for February '57. However, when the 1956 figures are all in, the final "high" for cycle 19 should be as preindicated as certainly as was dated the "low" between 18 and 19.

George Bonadio, W2WLR
Watertown, N. Y.

Dear Sir:

Your cover, and the article by George Jacobs, W3ASK, led me to buy the March, 1956, issue of *CQ*. Truly, the prospect offered by the prophet is so airy as to inspire every ham, and lift DC ops to the rarer ionosphere of VHF propagation.

However, and I'm so sorry, I just can't buy the prophecy. Worse, I'll go out on a prophetic limb myself, to forecast that the coming sunspot maximum and accompanying peak MUF (woe to me and my loved 6-meter amateur band!) will *certainly* be *lower* than the 1947 peak, and quite probably very much lower.

George reveals the flaw in his reasoning when he uses only cycles 8 through 18 as data for his "Average" curve.

Why did he choose to disregard cycles 1 through 7? He doesn't say, but I suspect that it must have been because he didn't like the look of those 1805 and 1816 minimums. Ignoring these, he is able to build up a most impressive prediction, but it isn't scientific. He reveals ignorance of the longer cycles of sunspot activity. He rejects pertinent data, and so weights his "average" to the point of distortion.

I can only say that no one wishes more than I do that he might be right. I hope that I'm wrong!

Hollis French
Moosup, Connecticut

K2ORS Editorial

Dear Sir:

For the first time in the last five years, as far as I can remember, there has appeared an important editorial in a radio publication—namely the one by K2ORS in your January issue.

Probably the most important clarification was the distinction between means and ends, a necessary understanding for life.

Surely there are other things (than electrons) which are important to us, and if these are the more important things, why not give them their proper due? If politics and religion are important, why not talk about them?

As amateurs we have the privilege of talking to people with distinct differences in environmental training and personal outlook who have a unique understanding of important questions. As amateurs we have this possibility of gaining wider knowledge. Thus a willingness to discuss important, fundamental questions should be an integral part of amateur radio operation.

Martin Wincott, K2BRY/9
Monmouth, Illinois

CQ Editor:

AMEN! to K2ORS' guest editorial on the low quality of current ham QSO's. Keep up the good work.

W6VWT

Behind the Scenes

Dear Wayne:

I wonder how many of today's amateurs appreciate the importance of the modest man whose picture appears in your March issue on page 53—left end of the second row.

His position in amateur transmitting radio is much like that of Lee DeForest in commercial radio—both of them were so far ahead that their work is not fully appreciated.

There was a time when all wavelengths below 200 meters were "worthless" and by *international* agreement were tossed at the radio transmitting amateur. Many years later various prominent people asserted that they

[Continued on page 18]

HOW MUCH SHOULD YOU PAY FOR A GOOD ROTARY BEAM?

The only true measure of value is (a) performance and (b) amount of aluminum per dollar cost. Study these specifications—compare them—and you too will agree, along with thousands of hams, that GOTHAM beams are best!

TYPE OF BEAM. All Gotham beams are of the full half-wave plumber's delight type; i.e., all metal and grounded at the center. No wood, tuning stubs, baluns, coils, or any other devices are used.

GAIN. Gotham beams give the maximum gain obtainable. Our 2-element beams give a power gain of four (equivalent to 6 db.); our 3-element beams give a power gain of seven (8.1 db.); and our 4-element beams give a power gain of nine (9.6 db.)

FRONT-TO-BACK RATIO. We guarantee a minimum F/B Ratio of 19 db. for any of our 2-element beams; 29 db. for any of our 3-element beams; 35 db. for 4-element beams.

MATCHING. Matching of the transmission line to the beam is extremely simple and quick. Everything is furnished and the matching is automatic. No electronic equipment or measuring devices are required.

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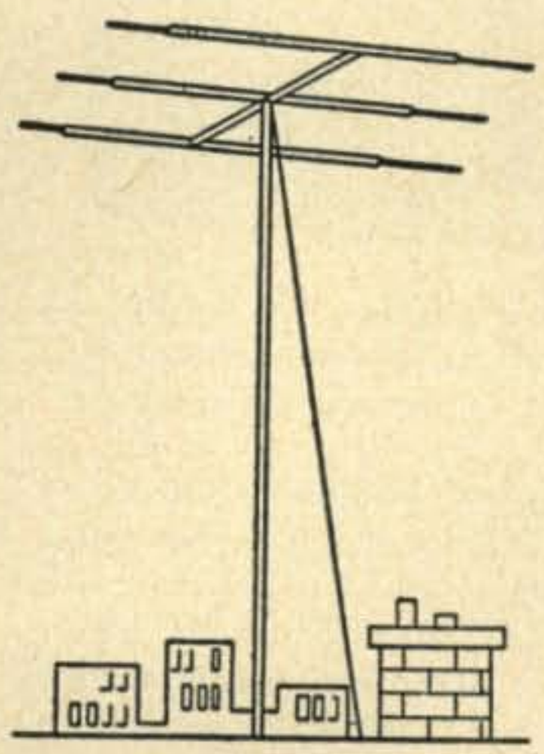
MAST. Any Gotham beam can be mounted on a simple pipe mast. Diameter of the pipe should be between ¾" and 1⅝".

STANDING WAVE RATIO. A very low SWR of approximately 1.5 to 1 will result from following the instruction sheet, depending on the height above ground and the surrounding area. If an SWR indicator is available, Gotham beams can be quickly and easily adjusted to 1.1.

STANDARD AND DELUXE BEAMS. Standard beams in the 6, 10 and 15 meter bands use ⅝" and ¾" tubing elements; the deluxe models for these bands use ⅞" and 1". In 20 meter beams, the standard has a single boom, while the deluxe uses twin booms.

WHAT WILL A GOTHAM BEAM DO? A Gotham beam will amplify the transmitted and received signal tremendously and will greatly reduce noise and QRM.



This Full Size Gotham Cost Only $21.95 And Brought In 87 Foreign Countries, All Continents And 30 Zones On 35 Watts!

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NEW VERTICAL ANTENNAS

ENGINEERED VERTICAL ANTENNAS for 40 meters, 80 meters, 160 meters. Gotham Hobby Corporation proudly announces three vertical antennas for unsurpassed performance on 40 meters, 80 meters, and 160 meters. Each antenna is absolutely complete, can be assembled in less than two minutes and requires no special tools or electronic instruments for adjustment and operation. Radiation is omnidirectional, with maximum radiation at the very low angles necessary for DX operation. These three vertical antennas have been developed over a period of three years in response to requests by hams for efficient, fool-proof, small-space, low-cost antennas for 40, 80, and 160 meters. Two 12 foot lengths of tubing and loading coil in each vertical antenna. Literature available.

V40 vertical for 40 meters $14.95
V80 vertical for 80 meters $16.95
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HOW TO ORDER: Send coupon with check or money order directly to GOTHAM or visit your local distributor. Immediate shipment by Railway Express, charges collect. Foreign orders accepted. Some leading distributors who handle GOTHAM beams: Offenbach & Reimus, Curle, M. N. Duffy, Alltronic, Purchase Radio, Lew Bonn Co., Henry Radio, Evans, Gib's Ham Gear, Hobe's Radio, Western Electronics, Harris Radio, Capitol Radio, Kinkade, Johannsen, W. H. Edwards Co., World Radio Labs, Graham Electronics, Geo. D. Barbey Co., Hudson Radio, Selectronic, Radio Electric Service, Ken-Els Radio, NRM Wholesale Radio.

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Enclosed find check or money-order for:

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☐ Deluxe 6-Element	$9.95	☐ 12-El	$16.95
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10 METER BEAMS			
☐ Std. 2-El Gamma match	11.95	☐ T match	14.95
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☐ Deluxe 4-El Gamma match	27.95	☐ T match	30.95
15 METER BEAMS			
☐ Std. 2-El Gamma match	19.95	☐ T match	22.95
☐ Deluxe 2-El Gamma match	29.95	☐ T match	32.95
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☐ Deluxe 3-El Gamma match	36.95	☐ T match	39.95
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☐ Std. 2-El Gamma match	21.95	☐ T match	24.95
☐ Deluxe 2-El Gamma match	31.95	☐ T match	34.95
☐ Std. 3-El Gamma match	34.95	☐ T match	37.95
☐ Deluxe 3-El Gamma match	46.95	☐ T match	49.95

(Note: Gamma-match beams use 52 or 72 ohm coax. T-match beams use 300 ohm line.)

NEW! RUGGEDIZED HI-GAIN 6, 10, 15 METER BEAMS

Each has a TWIN boom, extra heavy beam mount castings, extra hardware and everything needed. Guaranteed high gain, simple installation and all-weather resistant. For 52, 72 or 300 ohm transmission line. Specify which transmission line you will use.

☐ Beam #R6 (6 Meters, 4-El) $38.95
☐ Beam #R10 (10 Meters, 4-El) 40.95
☐ Beam #R15 (15 Meters, 3-El) 49.95

Name .....
Address .....
City ..... Zone ..... State .....

[from page 16]

had known all along that this was incorrect . . . but the first one to stir the matter up was Boyd Phelps.

In the face of apathy, and outright opposition, he demonstrated experimentally that communication was possible at higher and higher frequencies . . . and sometimes was so completely ignored that he had to work both the sending and receiving end of his test channels. As Boyd is not a twin this of course meant an automatic transmitter.

Even much later, when amateur bands were first assigned, there was an atmosphere of tolerant amusement at Boyd's insistence that these bands continue into the UHF area. It is absolutely certain that there would otherwise have been only one band—next door to the "standard" broadcast band.

I believe Boyd could easily have been the best-known man in amateur radio history if he had cared 7c for personal publicity. I was able to give him a little, but most of it went to people with more extroverted natures.

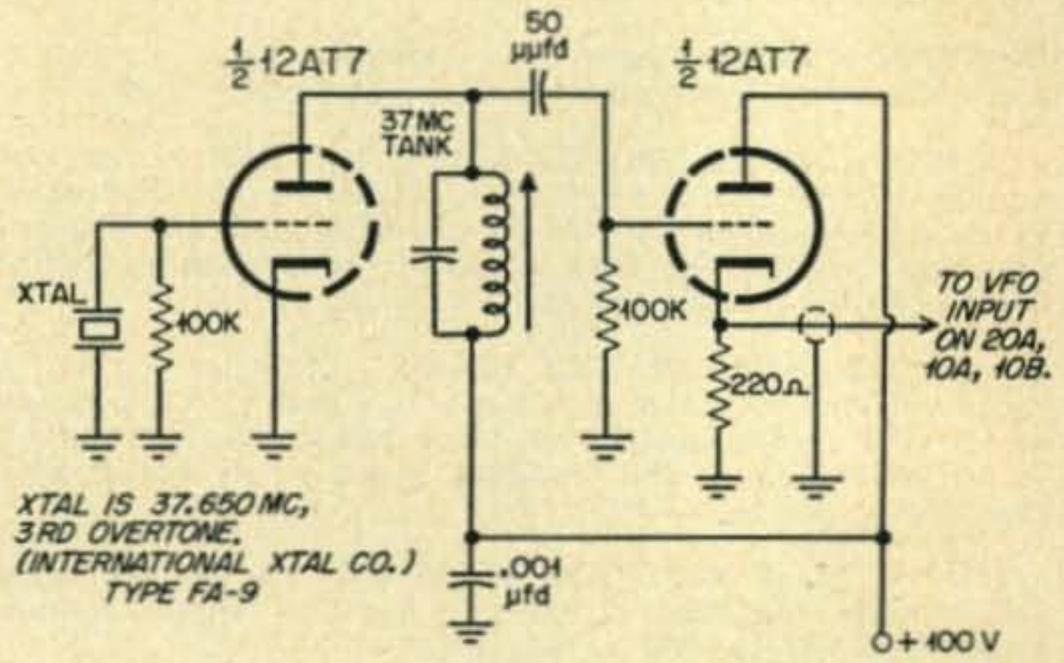
There is here a historical injustice . . . and a good story. Even today it could be well documented and illustrated.

Robert Kruse
Robert Kruse Laboratory
Madison, Conn.

To All Amateurs on SSB

Dear Ed:

We are trying to stimulate some interest in SSB on the 10 and 15-meter bands. Although quite a few have moved up to 10 and 15 already, we still don't have a good turnout. In order to make it easier to get contacts, the following frequencies have been more or less agreed on as a meeting place. On 15 meters 21,440 and on 10 meters 28,650. Upper sideband is most used on both bands. Let's make an effort to get our transmitters up on these bands and take advantage of the fine operating conditions here.



Here is a circuit to get Central Electronics exciter users up to 10 with a minimum of effort. VFO injection is the excuse most of the boys give for not being able to make it up to 10. Please put this where the boys will see it.

Jim Freund, W5QMI - DL4YU,
Vogelweh, Germany

Novice Q5'er

Dear Sir:

Believe me, the "Novice Q5er" is out of this world. I thought my old receiver with a Q-multiplier was good but there is no comparison. Now all I need is a Q-multiplier for the BC453 and no other receiver in the world will touch it.

And thank you again and again for the fine magazine you have made out of CQ.

W. S. Patton

Levittown Project

Dear Ed:

The Levittown article February '56 *CQ* was extremely interesting in that our own local Knox-Warren Radio Club is planning a similar activity. Such articles can't help but stimulate interest, and I am sure that further articles on construction as well as mobile installation would be very well received. As a matter of fact, for many of us who have our Technician License a complete step-by-step series of articles would be invaluable. By

[Continued on page 121]

Now better than ever!

the New HAMMARLUND HQ-140-XA

★ Continuously tunable from 540 KCS to 31 MCS with adequate selectivity to separate crowded signals.

★ Extremely high signal-to-noise ratio and positive noise limited for full use of receiver's high sensitivity.

★ Crystal filter provides extreme selectivity for high adjacent signal rejection.

★ Band-spread tuning on the four higher frequency ranges with direct calibration for the 80, 40, 20, 15 and 10 meter amateur bands.

A great receiver made better—that's exactly what Hammarlund has done with the new HQ-140-XA.

The new HQ-140-XA offers many new and exciting features—higher usable sensitivity—new, smooth-as-silk tuning with improved dial markings for greater accuracy—further refinements in the already fine superheterodyne circuitry—full 2-watt undistorted audio output—and many other advances.

The only way to appreciate what Hammarlund has done with the HQ-140-XA is to see it, touch it, try it. You'll be surprised to see how much better the "best" is now. Ask your supplier for complete details, or write for Bulletin C-556.

AT A NEW LOW PRICE

$249.50

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New...for Single Sideband!

THE "PACEMAKER"

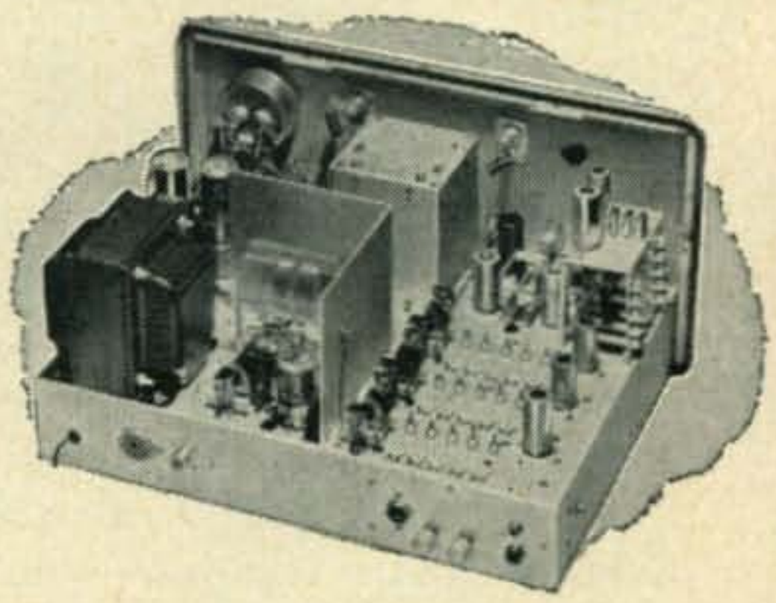
SSB

NO OTHER SSB RIG OFFERS YOU SUCH COMPLETE FLEXIBILITY!

Here is the exciting new Viking "Pacemaker" . . . designed for the amateur who wants **more** than just a single sideband "exciter." The "Pacemaker's" power puts it in the transmitter class with unmatched flexibility of operation and control. Completely self-contained and effectively TVI suppressed, the "Pacemaker" covers 80, 40, 20, 15 and 10 meters with single-knob bandswitching. Extremely stable, temperature compensated, built-in VFO operates in the 3 to 4 mc region at all times. VOX and anti-trip controls are easily adjusted for dependable operation. Pi-network output circuit will load virtually any antenna system . . . plenty of power here, too, to drive conventional or grounded grid amplifiers up to a full kilowatt.

Handsome maroon and grey cabinet measures only 11⅝" high x 21⅛" wide x 17⅜" deep, just right for desk-top operation. Supplied as a completely wired and tested unit only; all tubes furnished.

Cat. No. 240-301-2 Viking "Pacemaker," wired and tested, complete with tubes. . **$495.00 Amateur Net**



- **90 watts input SSB!**
- **AM and CW at the flip of a switch!**
- **Built-in, high stability VFO!**
- **"Fool-proof" voice controlled operation!**
- **Wide range pi-network output!**
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- **Compact . . . for desk-top operation!**

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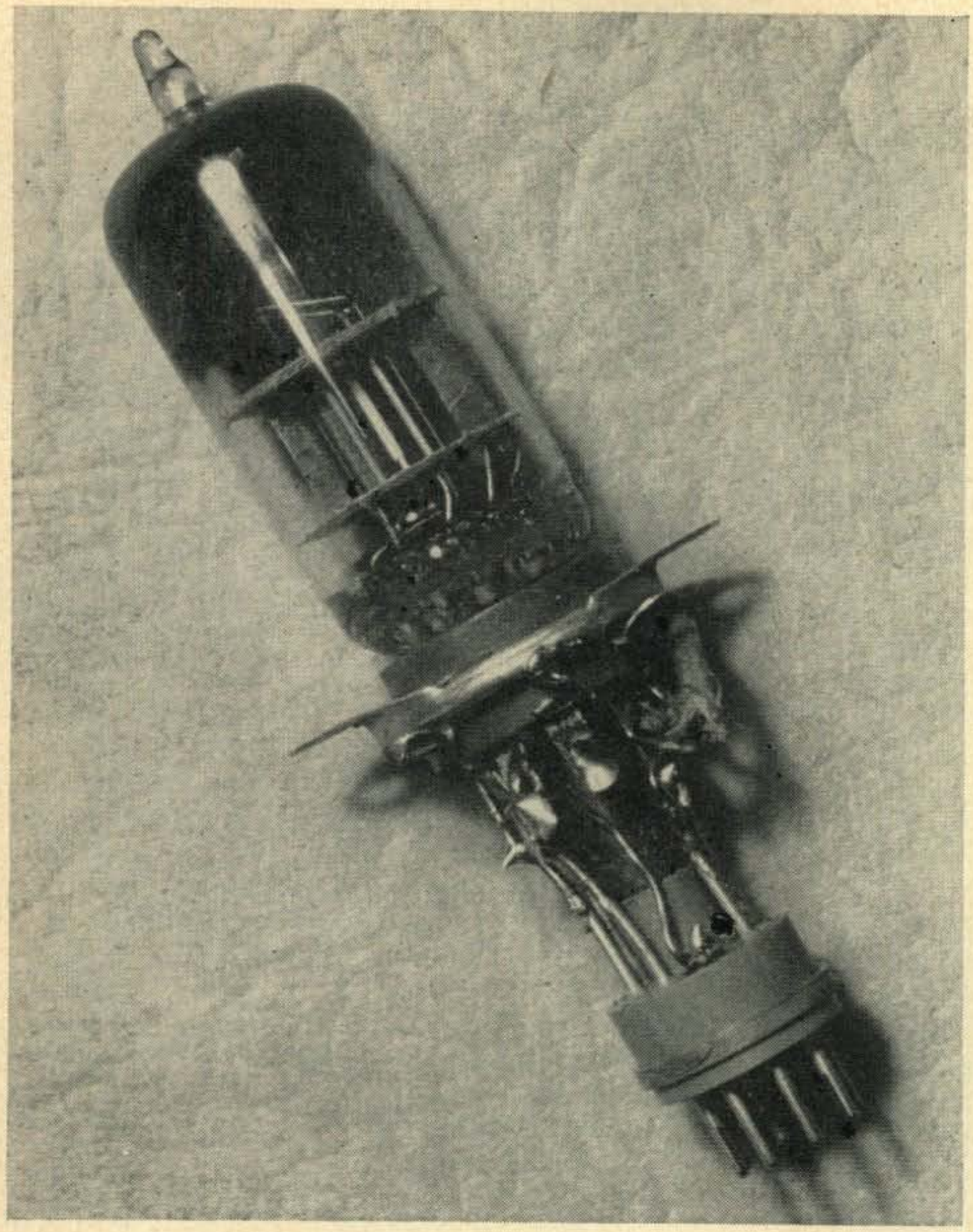


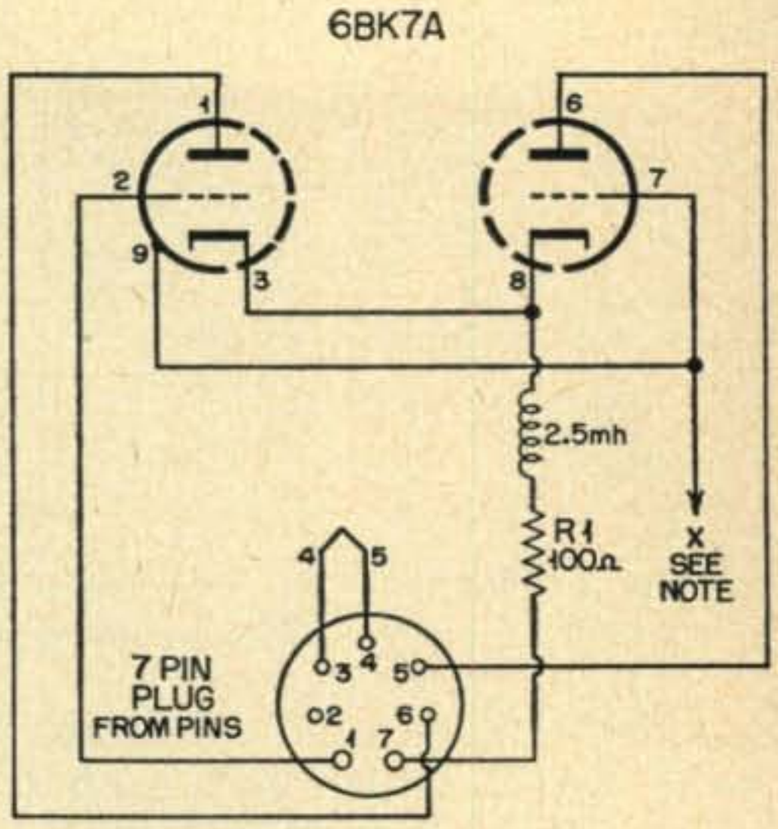


Fig. 3. "S-9'er" adapter to replace 6BA6-type tube.

The S-9er

Sam Canter, W6TSQ
2580 Polk St.
San Francisco 9, Calif.

I have read with considerable interest the occasional (all *too* occasional) articles on receiver design appearing in various ham publications. Each has emphasized the importance of a low-noise front end. Yet, commercial manufacturers continue to demonstrate a peculiar reluctance to incorporate these principles into their products. Nothing has been published, to my knowledge, for the benefit of the ham who owns a commercial job and doesn't want to ruin its trade-in value by tearing out its front end and replacing it with a less noisy tube and associated components. While it is true that an outboard addition would accomplish the same thing, lots of us have a definite aversion to having our operating position resemble the control panel of a B-52. What with outboard Selecto-Jets, Signal Slicers, Q-Multipliers, etc., etc., the average shack presents a formidable problem to the ordinary ham with only two hands!

Having built my own receiver, the prospect of reducing its trade-in value didn't concern me. However, as I live in an average-sized apartment with severe limitations on operating space, the addition of another outboard accessory would require either the stretching of my operating table or the removal of the dining room table. Either alternative was impossible in my case since the XYL had inflexible ideas on the subject.

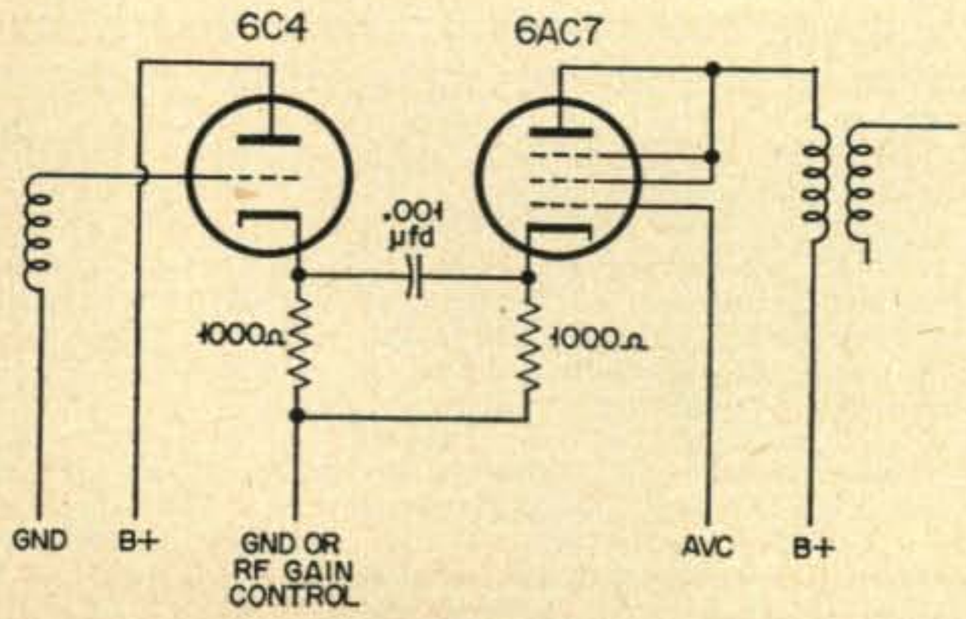


Fig. 1. Low-noise front-end circuit, prototype of "S-9'er".

Plug-in Adapter

The net result of all this skull-busting is an adapter which can replace any multi-grid front end of a receiver without laying a soldering iron on it. Circuits have been described which

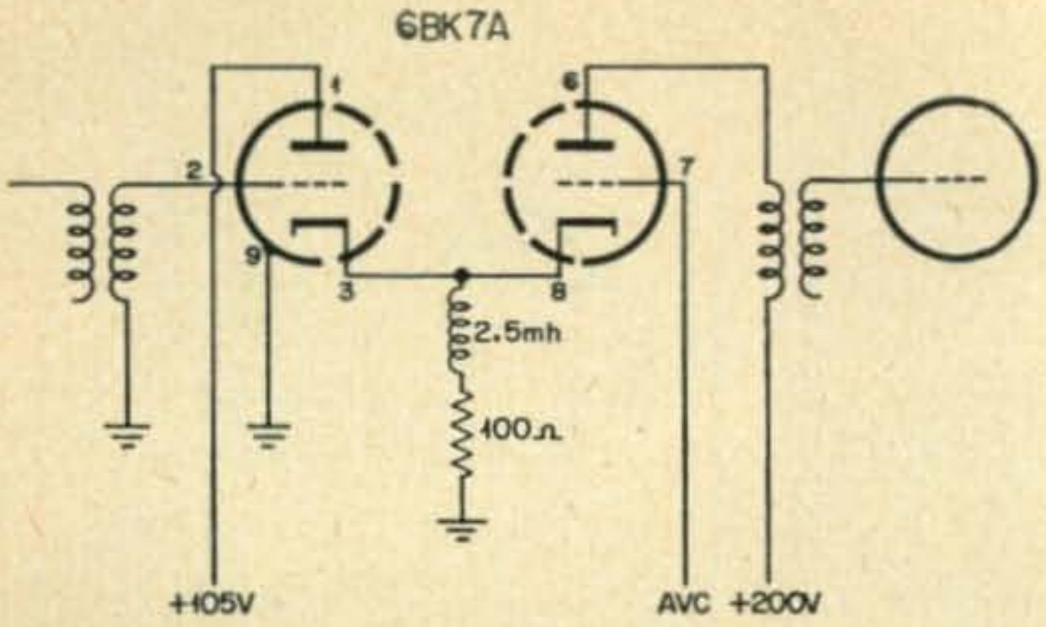


Fig. 2. Plugged into the standard First RF, the "S-9'er" provides this low-noise circuitry.

employ a 6C4 cathode follower cathode coupled to a 6AC7 which has been triode connected as in *Figure 1*. While this circuit shows a slight improvement signal-to-noise-wise over the usual pentode, the large cathode resistors reduce the mutual conductance of these tubes to the point where this modification is hardly worth the trouble. Besides, the use of two tubes presents a mechanical problem.

Research in the tube manuals revealed that the 6BK7A, on paper at least, would do all and more than the 6C4-6AC7 combination and with a minimum of components. There is no need to go into the many hours of experimenting, soldering, unsoldering, etc., that were expended in arriving at the final product. Suffice to say, *Figure 2* is the circuit diagram of the gizmo and, in my opinion, judging from results in my own and other receivers, it has been well worth the effort.

Results

This circuit was described over the air to a local ham, W60ZC, and an adapter was sent to him to try in the front end of his HF 10-20 converter. I considered this a good test since Doug lives in a normally quiet area and spends much time on the air due to being confined to a wheel chair. The results reported were gratifying. To quote Doug: "When I first plugged the 'gizmo' in I thought the receiver was dead. But when I tuned across 15 Meters, signals literally leaped out of the receiver. I now can hear noises and signals I didn't know existed before."

Now for the adapter. It must have a male plug to match the base of the pentode being replaced (7-prong miniature or standard octal) and a 9-prong noval socket for the 6BK7A. I do not know of any manufactured product that fits this exact description. A couple were located on a dealer's shelf here but nobody seemed to know where they came from. But a little ingenuity should solve this problem. *Figure 3* shows the correct connections on the adapter to replace a 6BA6. *Figure 4* shows connections for a 6SK7 type. A quick check of the tube manual will show connections for other types. The photograph may help to clarify construction.

Cathode Resistor

The value of cathode resistor shown was optimum for operation in my own receiver with 105 volts on the cathode follower and 200 volts on the grounded-grid triode portion of the 6BK7A. Should a tendency to oscillate appear, either more complete shielding or an increase in value of cathode resistor is suggested. However, in order to realize the fullest benefits from the "gizmo", increase in cathode resistance should be resorted to only when everything else has failed. In my own receiver, there are separate r-f and i-f gain controls. This enables me to run the front end wide open at all times and to reduce the i-f gain only when very strong signals have a tendency to block. This mode of operation produces the best signal-to-noise ratio since increasing bias results in a lowering of the mutual conductance and a raising of the noise figure.

An additional benefit of triode operation is the increased selectivity resulting from the higher input impedance presented by the cathode follower. In this connection, it is recommended that the transmit-receive antenna relay break the coaxial link between the transmitter and antenna tuner and feed the receiver through the tuner. While the receiver is practically dead on all bands other than the one to which the tuner is adjusted, the further gain in signal strength and selectivity coupled with a corresponding reduction in image and noise reception is not to be sneezed at. Every little bit helps. ■

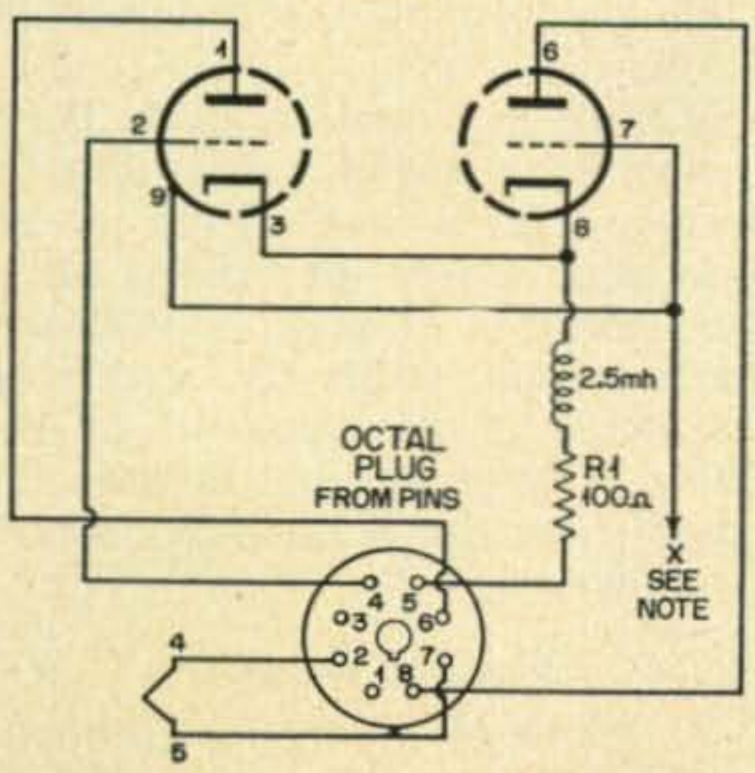


Fig. 4. "S-9'er" adapter for octal 6SK7-type r-f stage.

Notes

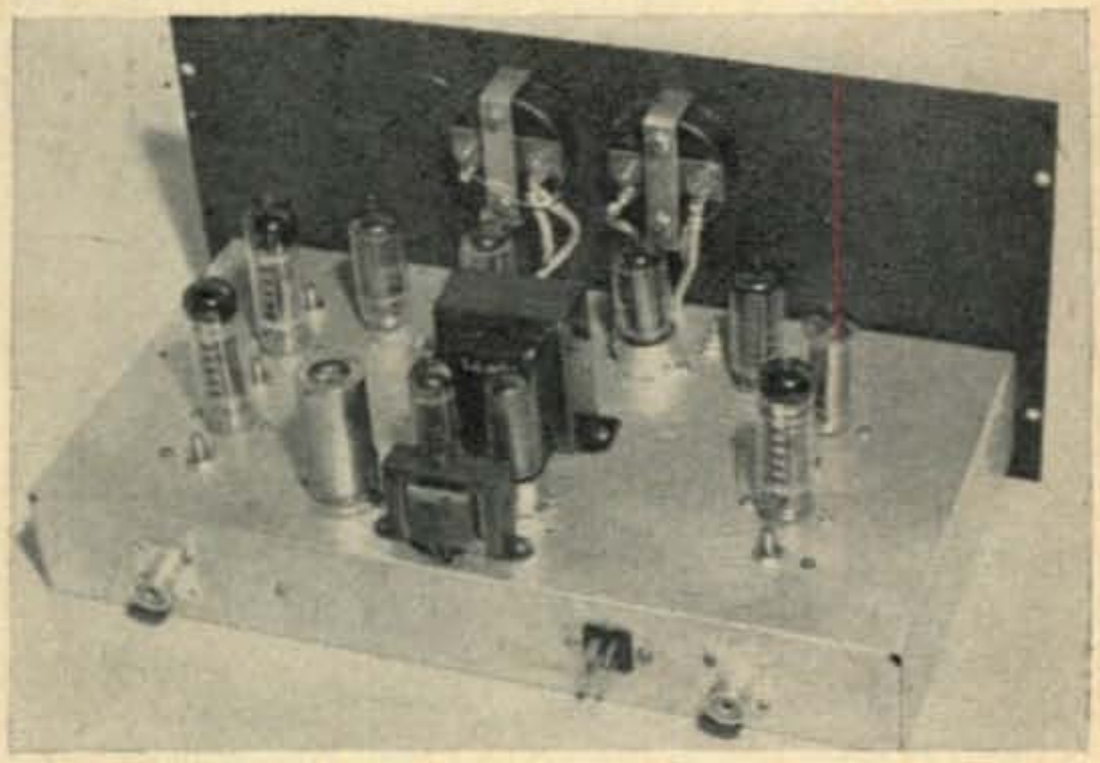
1. "X" should be grounded. Usually one filament lead is grounded, and pin 2 of the 6BA6 or pin 3 of the 6SK7 type is grounded. One of these may be used. If no such ground is available, a direct ground should be improvised.
2. If cathode resistor receiver is less than 100 ohms, the 100-ohm resistor in the cathode lead of the 6BK7A may be omitted, or:
3. Cathode resistor (R1) may be connected directly to junction of pins 7 & 9 of 6BK7A if this r-f stage is to be wide open at all times. This in effect would convert the receiver's r-f gain control into an i-f gain control, still without "tearing into the receiver."

A Bandswitching Rig for 144 and 220 Mc.

THE 2-220

Marvin Stern, W2AOC

9701 Shore Rd., Brooklyn 9, N. Y.



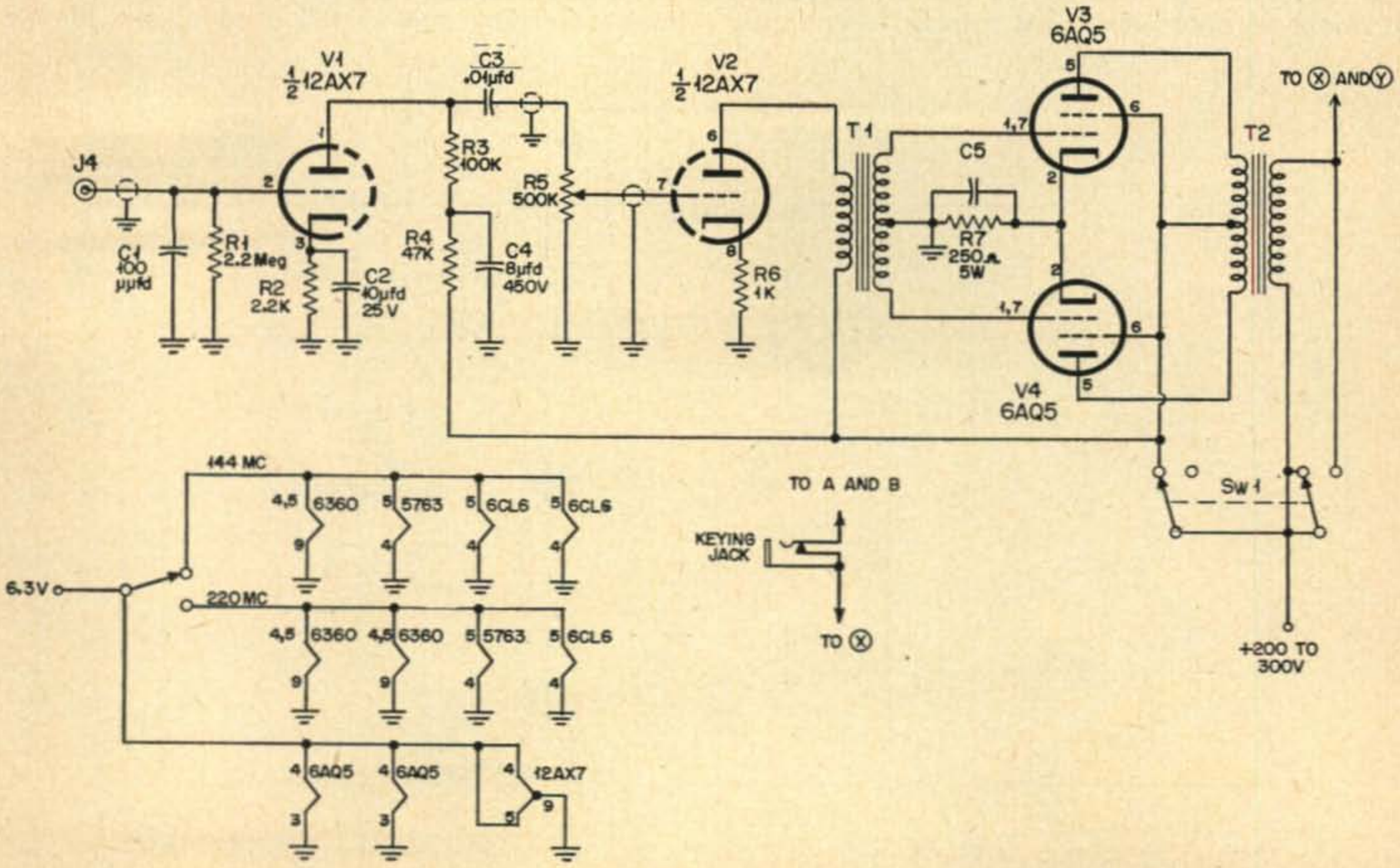
One small chassis accommodates the two VHF transmitters and a common modulator.

For years now, standard practice on the low frequencies involved the use of bandswitching rigs. Because of excessive lead lengths VHF men have not been able to avail themselves of this feature. Normal practice has been to build separate rigs for each VHF band, switching power supplies and modulator to the rig in use.

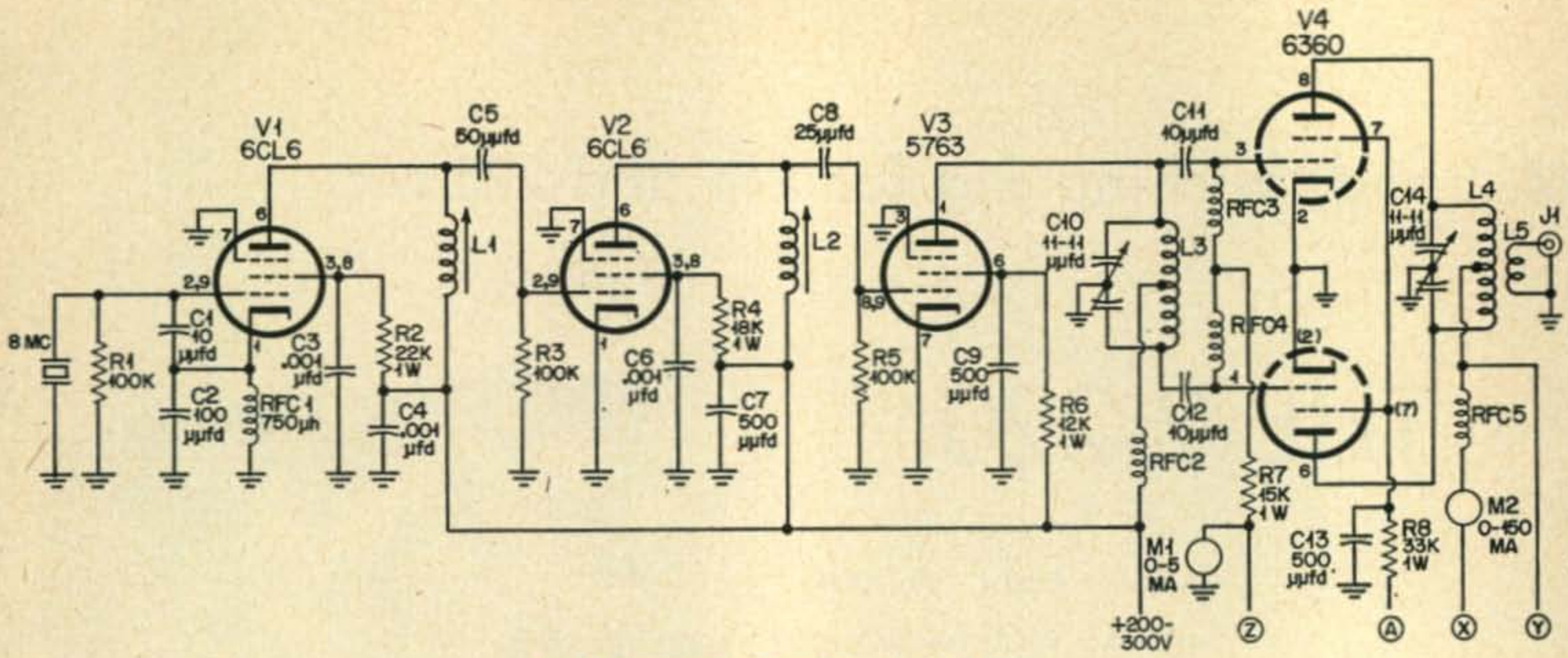
At my QTH, operation on both 144 and 220 Mc. was planned with 420 Mc. relegated to the future. Features desired in the new rig were simplicity in switching from one band to another, compactness, and a moderate price tag. (About $75)

This two-band rig solved the problem admirably. It can serve as a low powered rig or can be used as an exciter for higher powered finals such as an 829B or 5894. At my QTH it will also drive a multiplier to 420 Mc. Provision for installation in the family car has been made.

The introduction of the new *Amperex 6360* has made the 220 Mc. picture much brighter



Modulator and switching circuit for the 2-220.



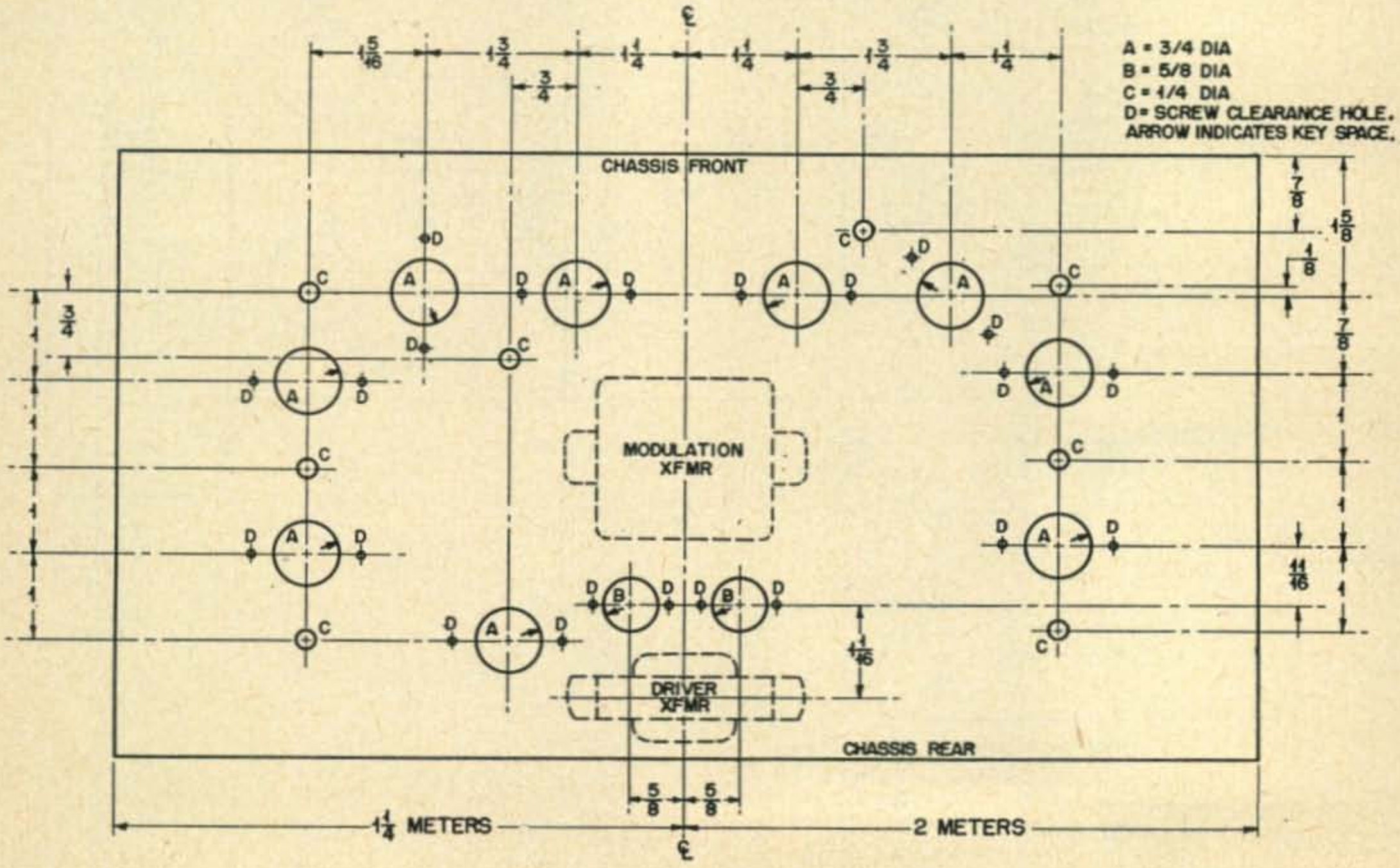
144-Mc transmitter section of the 2-220.

for the low power operator. The tube can be run at a maximum of 24 watts input on both 144 and 220 Mc. Its low price tag ($4.00) is something that makes it even more attractive to most hams. Circuitwise, the oscillators are identical in both sections, but here the similarity ends. 8 Mc. crystals are used in the 144 Mc. range, and 12 Mc. crystals in the 220 Mc. range. In the 144 Mc. section the next stage is a 6CL6 tripling to 72 Mc., followed by a 5763 doubler to 144 Mc. This stage is capacitively coupled to the 6360 final amplifier.

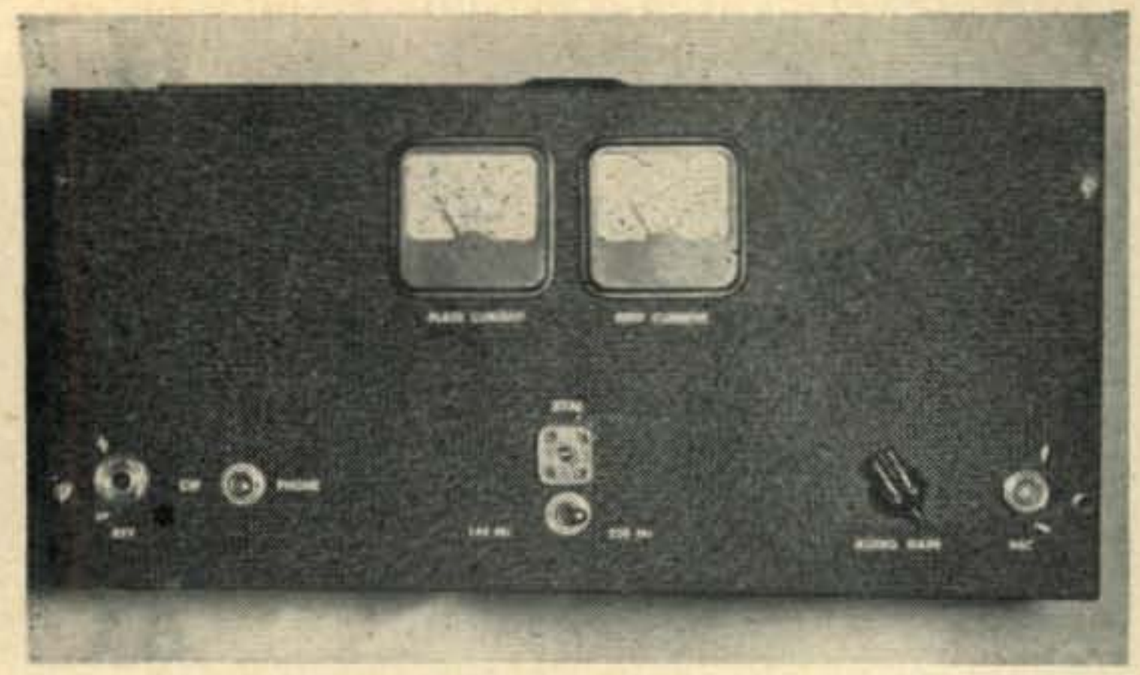
In the 220 Mc. section the second stage is a 5763 doubler with a balanced tank circuit driving a push-pull 6360 tripler. This stage is inductively coupled to the 6360 final amplifier. It might be noted here that capacitive coupling to the final was attempted at first, but the physical placement of the coupling capacitors proved to be so touchy as far as grid drive to the final was concerned that it was abandoned in favor of the inductive method.

Bandswitching is accomplished by wiring both transmitters in parallel as far as B+ and metering circuits are concerned, and merely applying filament voltage to the section desired. The modulator is also in parallel with both sections, with filament voltage applied all the time, regardless of the band in use.

Keying in both bands is accomplished in the screen circuit of the final. Cathode keying was attempted at first but this led to instability in the amplifier due to the excessive length of the leads. The key and closed circuit jack *J3* are



Chassis layout details.



hot with B+, so that an insulated key will have to be used, as well as insulating *J3* from the chassis and panel.

Construction

Constructional details can be seen in the photographs. If the chassis layout is followed closely, the only leads existing besides power leads are the pigtails on the associated resistors and condensers. The front panel layout is shown in the photo, although this can be altered to suit the individual.

On the original model a dual xtal socket was used (as shown), however single xtal sockets can be mounted adjacent to their respective oscillators on either side of the bandswitch.

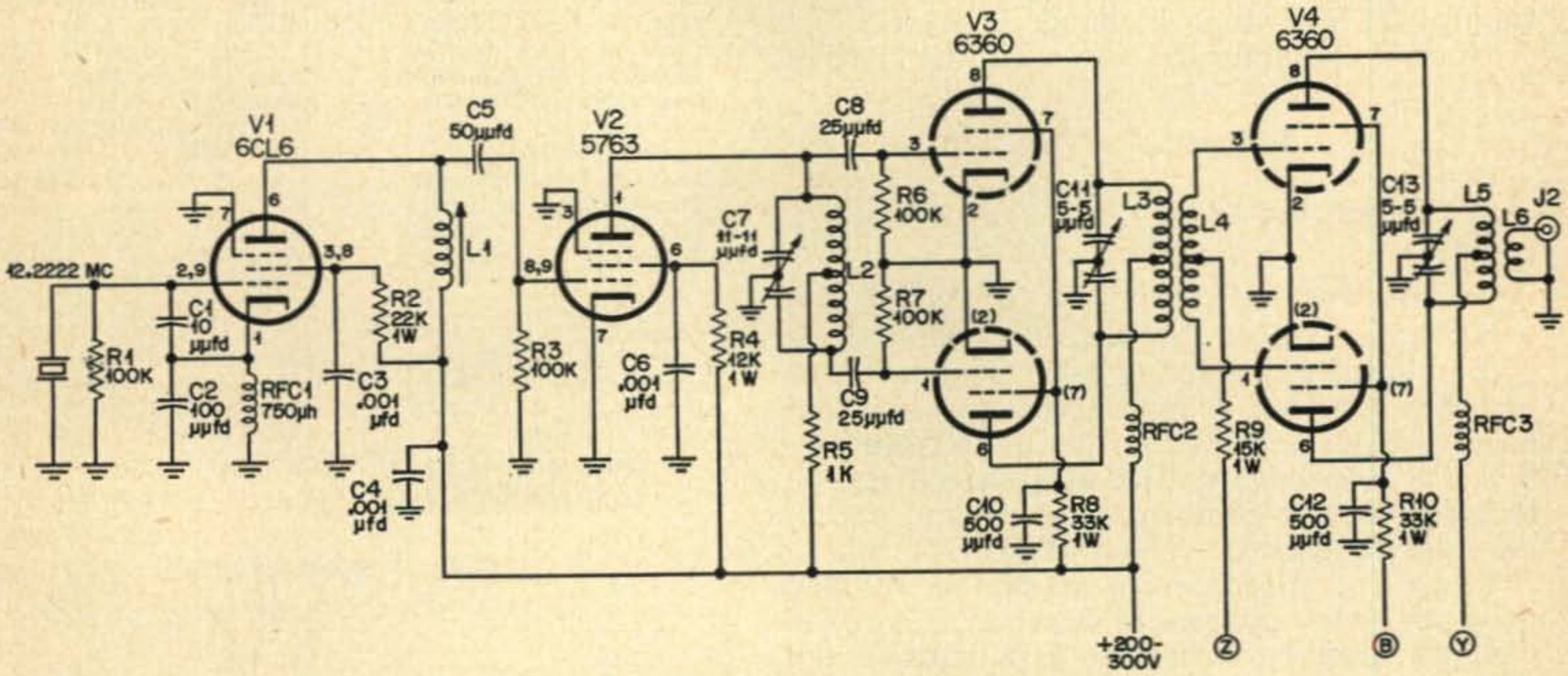
Be sure to mount tube sockets in the positions shown, as this alignment assures minimum lead lengths between stages.

The use of shielded wire in the final plate and grid leads is necessary to provide proper isolation of grid and plate circuits. Although regular hookup wire can be used throughout the rest of the rig. Shielded wire is easy to work with and its use is highly recommended.

After wiring, the usual checks for shorts should be made. It is suggested that B+ connections to the various stages be made stage by stage as testing progresses, in order to protect the tubes.

Power requirements are 200-300 volts at approximately 250 ma and 6.3 volts at 4 amps. Lower voltages should be used for testing.

At this point, beg, borrow, or ——. Oh well, just try to get hold of a grid-dip meter.



220-Mc. transmitter section of the 2-220.

Its use will save you much time, toil and aggravation.

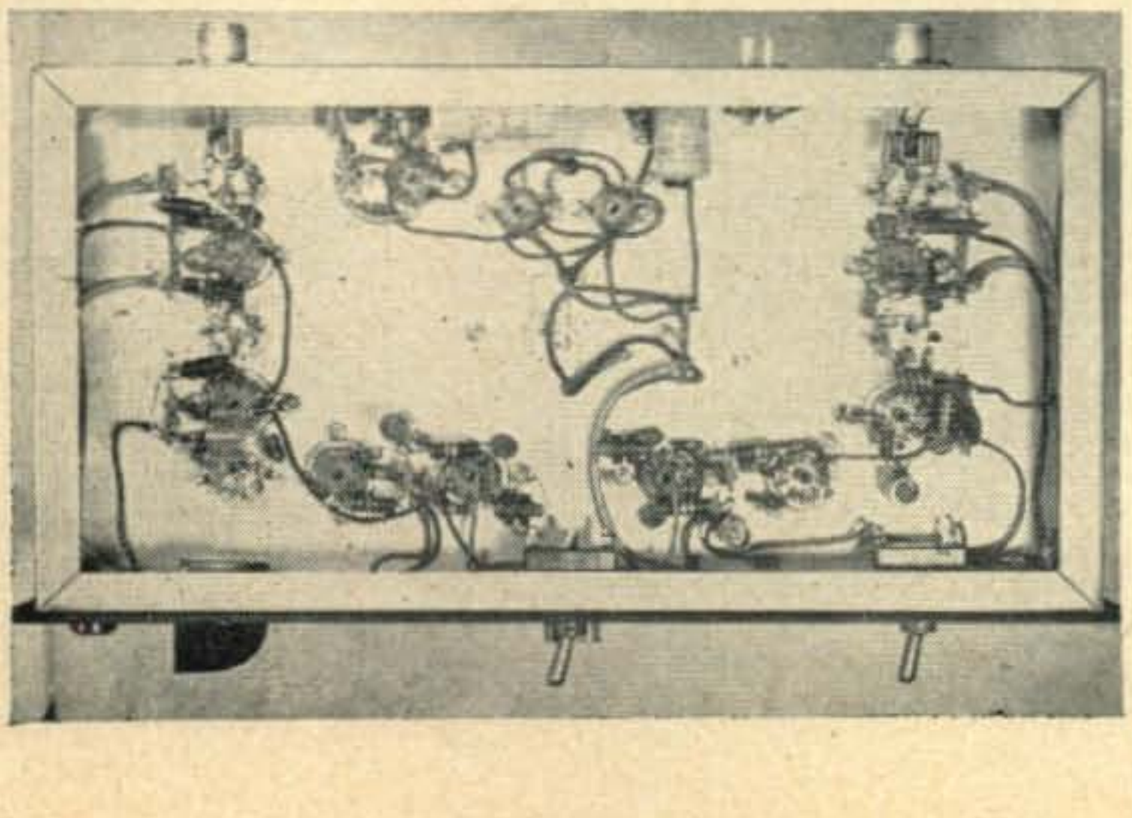
Tuning

Apply filament voltage to the 144 Mc. section. Starting with the oscillator, adjust the coil slugs and tuning capacitors for approximate resonance as indicated in table. When this is done, throw the bandswitch to the 220 Mc. section and repeat the tuning process.

When all the tuned circuits have been lined up, plug the key into *J3* (leaving the contacts open) or just plug in an ordinary phone plug. This will open the screen circuit to the finals and cut off the plate current, preventing damage to these tubes if the coils are not tuned up properly.

Place the Fone-CW switch in the CW position. This will cut off B+ to the modulator section.

Starting with the 144 Mc. section, apply B+ and tune *L1*, *L2*, and *C10*, for maximum final



grid current.

A dummy load such as a 10 or 15 watt lamp should be plugged into *J1*. Remove the plug from the keying jack and tune *C14*, for maximum brilliance in the lamp load. Adjust *L5* for maximum output. *C14* will have to be retuned everytime the position of *L5* is changed. After this is done repeat *C10* again for maximum grid current.

It is suggested that during adjustment, a crystal that falls approximately in the middle of your own operating range be used. Coils *L1* and *L2* are relatively broad in frequency response, and do not require retuning unless a change of 1½ Mc. or more is being made, thus only the plate and grid coils of the final need be retuned when making moderate frequency changes.

The 220 Mc. section is adjusted exactly as the 144 Mc. section, except for the coupling between the tripler and final. The position of *L4* is adjusted for maximum grid current, retuning *C11* everytime a change is made.

Normal operating conditions for the finals at 300 volts is as follows:

	144 Mc.	220 Mc.
Plate Current	60-80ma	60-80ma
Grid Current	1½-3½ ma	1 - 3ma

Neutralization of the finals (if required) is accomplished by soldering a 3/8" length of #20 tinned wire to *pin 1* and another to *pin 3* and bending them nearer or farther away from *pins 6* and *8* respectively. The wire should not be crossed over one another, as this is done within the tube structure.

When operating the rig on phone, the key need not be left plugged in, however if it is, the contacts must be closed. In CW position the secondary of the modulation transformer is shorted and B+ removed from the modulator.

Power output at 20 watts input is about 13 watts on 144 Mc. and 10½ on 220 Mc. Tune for maximum output rather than for minimum plate dip, in case they do not coincide. ■

PARTS LIST

144mc

R1, 3, 5—100k ½ W
R2—22K 1W
R4—18K 1W
R6—12K 1W
R7—15K 1W
R8—33K 1W
C1, 11, 12—10 μμf ceramic
C2—100 μμf ceramic
C3, 4, 6—.001 disk ceramic
C5—50 μμf ceramic
C7, 9, 13—500 μμf disk ceramic
C8—25 μμf ceramic
C10, 14—11 μμf miniature butterfly variable (Johnson 11MB11)
RFC1—750 μh R.F. CHOKE (NATIONAL R-33)

220mc

R1, 3, 6, 7—100k ½W
R2—22K 1W
R4—12K 1W
R5—1K ½W
R8, 10—33K 1W
R9—15K 1W
C1—10 μμf ceramic
C2—100 μμf ceramic
C3, 4, 6—.001 disk ceramic
C5—50 μμf ceramic
C7—11 μμf butterfly (Johnson (11MB11)
C8, 9—25 μμf ceramic
C-10, 12—500 μμf disk ceramic
C11, 13—5 μμf butterfly (Johnson (5MB11)
RFC1—750 μh R.F. CHOKE (NATIONAL R-33)

PARTS LIST

MODULATOR

R1—2.2 meg.
R2—2.2K
R3—100K
R4—47K
R5—500K pot.
R6—1K
R7—250 ohm 5W
C1—100 μμf
C2—10/25V
C4—8/450V
C5—50 μfd, 50V
C3—.01
T1—Interstage transformer, single plate to push-pull grids, secondary-to-primary turns ratio 3 to 1 (Merit A-31X)
T2—Modulation transformer. 10,000 ohm primary, 4500 ohm secondary (Thordarson 21M52)

MISCELLANEOUS

S1—DPDT switch
S2—SPDT switch
J1, 2—Coaxial connector (Amphenol 83-1R)
J3—Closed circuit jack
J4—Microphone connector
M1—0-5 ma
M2—0-150 ma
7 X13 X 2 chassis (Bud AC 409)
Cabinet and Panel (Bud C409)

COIL TABLE

	144mc	220mc
L1	14 turns No. 28 Enamel on 3/8 inch iron slug form (CTC-LS3)	9 turns No. 28 Enamel on 3/8 inch iron slug form (CTC-LS3)
L2	4½ turns No. 18 Enamel on 3/8 inch iron slug form (CTC-LS3)	7 turns No. 20 ½ inch diam., 7/16 inch long center tapped (B & W Miniductor 3003 or Air Dux 416T)
L3	5 turns No. 16 Tinned, 3/8 inch diam., ½ inch long center tapped	4 turns No. 18 Enamel 3/8 inch diam., center tapped. Space diam. of wire, except for 3/16 inch space at center
L4	6 turns No. 18 Enamel, 7/16 inch diam., center tapped. Space diam. of wire, except for 3/16 inch space at center	2 turns same as L3, center tapped. Adjust spacing and degree of coupling for maximum grid current
L5	2 turns same as L4	Same as L3
L6	——	2 turns same as L4

RESONANT FREQUENCIES

L1—	24 Mc.	36.67 Mc.
L2—	72 Mc.	73.34 Mc.
L3—	144 Mc.	220 Mc.
L4—	144 Mc.	——
L5	——	220 Mc.

Rocky Mountain Division ARRL Convention

The Denver Radio Club is sponsoring the 1956 Rocky Mountain Division Convention to be held at the Elkhorn Lodge, Estes Park, Colorado on June 9 & 10, 1956.

Elkhorn Lodge is situated near some of the most scenic parts of the Colorado Rockies and can be reached by excellent paved highways. Nearby is the Rocky Mountain National Park with its wildlife, fishing, and high peaks. Arrange your summer vacation to include the convention and the hospitality of cool, colorful Colorado.

There will be activities for all, including prizes, technical talks, transmitter hunt, an on-the-air station, YL & XYL program, entertainment, fishing, and mountain trips —fun for the entire family.

Registration fee is $3.50 per person. Special rate of $2.50 given if registration is postmarked no later than June 3rd. For registration blanks, hotel and meal rates, write to: Taylor Shreve, WØCXW, 1230 Valentia Street, Denver 20, Colorado.

Attn! N. Y. & N. J. Hams

May 6 is the date for the testimonial dinner for W2SN at the Robert Treat Hotel in Newark, N. J. Doors of the Rag Chew Room open at 4 p.m., main event at 6:30. Tickets available *by mail only* from Rev. Charles L. Wood, W2MVX, 15 Church St., Fair Haven, N. J. for $6. (See details in "Letters to the Editor," April CQ.)

Don't let the word "audio" throw you into a fit of disinterest. This is quite a fascinating device . . .

Tuning-Fork Audio Frequency Standard

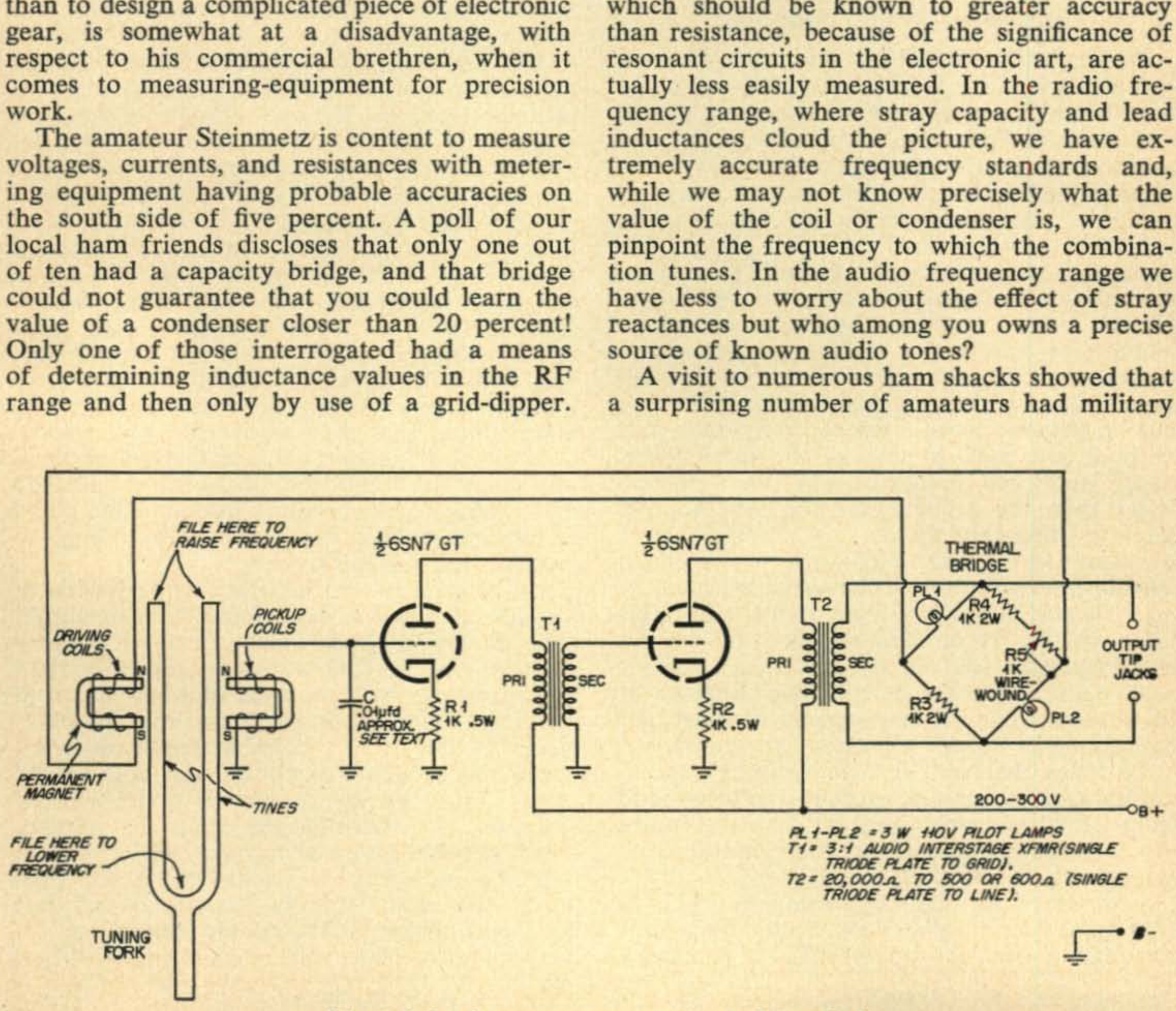
by John Williams, W2BFD
38-06 61 St.
Woodside, L.I., N.Y.

The more serious-minded radio amateur: He who gets more pleasure out of the planning and building of equipment than working DX or rag-chewing, and who enjoys nothing better than to design a complicated piece of electronic gear, is somewhat at a disadvantage, with respect to his commercial brethren, when it comes to measuring-equipment for precision work.

The amateur Steinmetz is content to measure voltages, currents, and resistances with metering equipment having probable accuracies on the south side of five percent. A poll of our local ham friends discloses that only one out of ten had a capacity bridge, and that bridge could not guarantee that you could learn the value of a condenser closer than 20 percent! Only one of those interrogated had a means of determining inductance values in the RF range and then only by use of a grid-dipper. This technique would, again, require the knowledge of the shunting capacity in order to *calculate* the inductance.

You will notice that inductance and capacity, which should be known to greater accuracy than resistance, because of the significance of resonant circuits in the electronic art, are actually less easily measured. In the radio frequency range, where stray capacity and lead inductances cloud the picture, we have extremely accurate frequency standards and, while we may not know precisely what the value of the coil or condenser is, we can pinpoint the frequency to which the combination tunes. In the audio frequency range we have less to worry about the effect of stray reactances but who among you owns a precise source of known audio tones?

A visit to numerous ham shacks showed that a surprising number of amateurs had military



Schematic for the super-accurate Tuning-Fork Standard.

surplus frequency meters of the BC-221 or LM-11 type. These, and other similar units, in skilled hands can be practically considered laboratory instruments even though they are far from being primary frequency standards. On the other hand, questioning many amateurs brought forth the fact that their best source of constant audio tone might be a code-practice oscillator or, if they were very advanced, a homemade one-tube audio oscillator with 129 percent distortion and a vague frequency "somewhere near 400 cycles". We listened to these oscillators. They had the full-throated richness of a Stradivarius with the Formula-21 varnish. Most of them, when keyed, had the delightful frequency variation of a Hawaiian guitar, a musical saw, or a Theremin.

It would be wrong to suggest that such oscillators do not have a purpose for their existence, but we can be certain that their place in the scheme of things does not include serving as a source for precision measuring techniques in the audio frequency range. Now isn't it likely that more radio amateurs would carry their experimentation past the diagram stage if better measuring equipment were in their possession?

Purpose of Audio Standard

Why all the fuss about *audio* frequencies, you ask, when we are already scraping at the microwave doorstep at the other end of the spectrum? Well, for one thing, most of the new and advanced technique presently under investigation, such as single sideband, radioteletype, facsimile, amateur television, etc., etc., require a knowledge or control of audio *phase*. The phase-shift networks for "sideband" are a good example of the need, not only for stable frequency audio sources, but sources whose frequencies are known within a cycle or two and which will hold within that tolerance for the duration of lengthy tests. In radioteletype and facsimile work, where frequency-shift methods are used to convey the intelligence, audio frequency networks and filters are no better than the accuracy of the tone sources employed to adjust them.

Just as quartz oscillators complement tunable interpolating oscillators in r-f measuring schemes, it is only logical that adjustable audio oscillators be accompanied by precise spot-frequency sources for any near-scientific work we may want to accomplish. Because of the physical difficulty and expense of constructing accurate single-frequency generators of audio tones that will be equally indifferent to vibration, temperature, supply voltages and aging of components, few of us will venture into experiments requiring small tolerance of frequencies in the voice range.

A series of articles,[1] beginning in 1933, in *R/9* magazine ("father" of *Radio* magazine, granddaddy of *CQ*) by W6DEI, a telephone engineer, gave full theoretical and practical information to construct a high-quality "sideband" rig. Through reading this material the writer, W2BFD, became obsessed with a desire to make precision audio frequency measurements in order to build the required band-pass filters and a 500-watt sideband rig was put on the air around the middle of 1934. We have always felt that adequate credit was withheld from this westcoast pioneer of sideband when S.S.S.C. was "rediscovered" in January 1948.

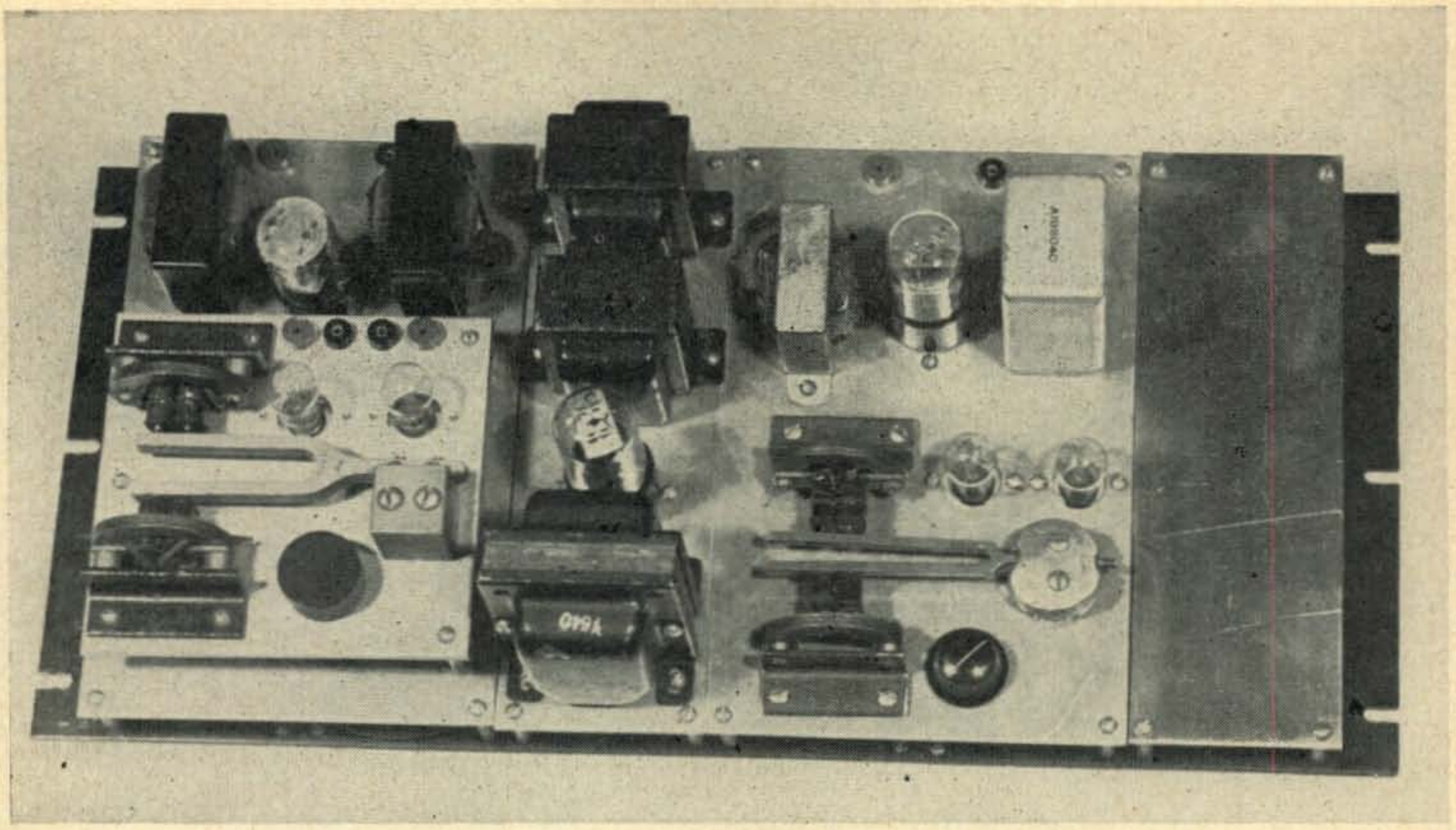
Anyway, to tune up and measure the components of these sharp audio filters, a tuning-fork oscillator, built in 1929, was pressed into service and, as a result of a compulsion to improve this device, an entire series of electronically-driven mechanical oscillators, using steel clockspring reeds and tuning-forks was constructed. One fact emerged from the volume of data collected and that was that even the poorest tuning-fork oscillator was head-and-shoulders above the best all-electronic audio generator and a close competitor to magnetostriction oscillators. The beauty of the fork oscillator, just as with quartz crystals, is that 99 percent of the accuracy and stability resides within the fork itself and the remaining components have an almost neglible effect on the output precision.

The first tube-driven fork oscillator built by the author made use of a fork taken from an ancient General Radio microphone-actuated mechanical oscillator. The tuning-fork was regarded as something exceedingly precious until a conversation with a musician brought out the fact that very good forks are obtainable from well-stocked music stores and musical supply-houses[2] for anywhere from 25¢ to a couple of dollars. A frenzied buying "spree" came about after acquiring a half-dozen forks at 15 cents apiece. Now that the mental state has worn off we think it possible that a fork oscillator for every cycle of the audio range was planned (but then we learned about oscilloscopes and Lissajou's figures). Most of these musicians' "A" and "C" forks gave excellent performance when properly mounted and could be altered over quite a range, by filing, to produce the exact frequency desired.

It was soon found that the best performance was not obtained without some form of amplitude limitation. If adequate feedback is provided so that the fork will start oscillating, then the amplitude will continue building up until the tines of the fork rattle against the pole-pieces of the driving coils. If feedback is reduced the oscillations will die out completely, rather than merely reducing amplitude of vibration. By adjusting the electrode voltages the tube could be made to overload before the fork amplitude became excessive but this produced an output rich in harmonics and left the vibration amplitude mainly determined by the amount of plate voltage on the tube. When

1. R/9 Sept. 1933 Page 7, Dec. 1933 Page 18, Jan. 1934 Page 25.

2. American Piano Supply Co., 229 Fourth Ave., New York, N.Y.



Unit-constructed chassis of the Tuning-Fork Standard.

a pure tone was needed the output had to be passed through a filter. Some form of AVC was indicated and the first such assembly used radio receiver methods whereby some of the output was amplified, rectified, and applied as gain-reducing bias to a driving stage. This worked very well but took a lot of stuff to do the job and was quite bulky. Not much improvement on the amplitude-limiting circuit was obtained until the arousal of public interest in volume compression and expansion for phonograph amplifiers.

An early form of volume compressor or expandor, which later lost favor because of its sluggishness of operation, consisted of a Wheatstone Bridge arrangement having the usual four resistance "arms". Two of these arms were common resistors while the remaining two were thermally-sensitive resistances. Small pilot lamps were used for the heat-sensitive elements. The amplifier output was fed to two opposite corners of the bridge while the loudspeaker load was connected across the remaining corners. If the initial adjustment of the common resistances was such that heating of the lamps tended to balance the bridge then volume compression was the result, since no output, regardless of input level, could be obtained at balance. On the other hand, if the heating of the lamp arms tended to unbalance the network, then the volume of sound output from the speaker went up faster than the increase in signal input and volume expansion was the result.

Application of the lamp-bridge idea to the tuning-fork oscillator made it possible to build a precision audio generator with amplitude control and needing only a single tube. The sluggishness was no handicap for this purpose, in fact it is highly desirable. Once amplitude limiting is provided, the gain of the amplifier can be raised. This enables quicker starting when the power is turned on. There is always a minute amount of room vibration present. This vibration, even though at an extremely low amplitude, generates a small voltage in the pickup coils connected to the amplifier input. The amplifier output finds easy passage through the greatly unbalanced bridge and drives the fork's other tine with a husky signal. The fork vibration immediately starts to increase which, in turn, passes still more current through the bridge. The lamp arms heat up, altering their resistance in the direction required to balance the bridge. The fork motion will seek a point of equalibrium where the amplitude remains constant. It may "hunt" for several seconds before steadying down at this level. The amplitude at which stabilization takes place can be adjusted by making one or both of the non-heat sensitive resistors variable. The greatest frequency accuracy is had at the point where the fork is barely oscillating, generally on the threshold of audibility. At this point the output wave-form is also the closest to a sine wave. Rich audio harmonics at multiples of the fork fundamental can be secured by raising the amplitude level. In exceptionally quiet rooms several minutes may be required for the fork amplitude to build up from zero. The sound of a voice can start it instantly.

W2BFD's first need was a 1000-cycle sine-wave generator for capacity and inductance

[*Continued on page 110*]

Robert Weinstein, W2JAY
25 Greglawn Drive
Clifton, New Jersey

This, we believe, is a first

Calculating Beam Gain

The (W)Einstein Theory

What is the theoretical maximum performance you can obtain from a parasitic beam antenna? The writer, in the course of his work for a beam manufacturer, has searched the literature in vain for some simple means of determining in advance the gain that could be expected from any particular design.

Observed data showed that the gain of a beam antenna increases with the addition of elements, and that the spacing of the elements, and their overall length, affected maximum gain. Moreover, there was an inter-relationship between these factors, as anyone who has tuned a beam will testify.

From the observed data and from hundreds of tests and experiments, charts were prepared showing gain figures of various popular beam models. It was discovered that a simple formula, involving only three factors, satisfied all of the assembled data. The formula was: That the maximum gain obtainable from a parasitic half-wave beam antenna is given by the formula:

$$G_p=E+[E(1+S)]$$

where: G_p=Power Ratio Gain Over Reference Dipole
E =Number of Elements in Beam
S =Average Wavelength Spacing Between Elements

The formula assumes perfect conditions, i.e., that the beam is of reasonable design (spacing not reduced or lengthened to reduce gain); that the beam is adjusted (particularly element spacing and element lengths) for maximum forward gain; that a standing wave ratio of 1:1 is maintained; that the antenna is mounted at maximum effective height in free space; and that there are no transmission line losses. It should be stated that the formula has also been confirmed by the published gain charts of leading antenna manufacturers and by articles in leading amateur publications.

Example 1: What is the power gain of a three element half-wave beam antenna, with .1 wavelength director spacing and .2 wavelength reflector spacing?

From the formula, $G_P=3+[3(1+.15)]=6.45$

This Power Ratio Gain is equivalent (see chart) to a gain of 8.1 decibels.

Example 2: What is the power gain of a four element half-wave beam antenna with a .1 wavelength spacing for the 1st and 2nd directors, and .25 wavelength reflector spacing?

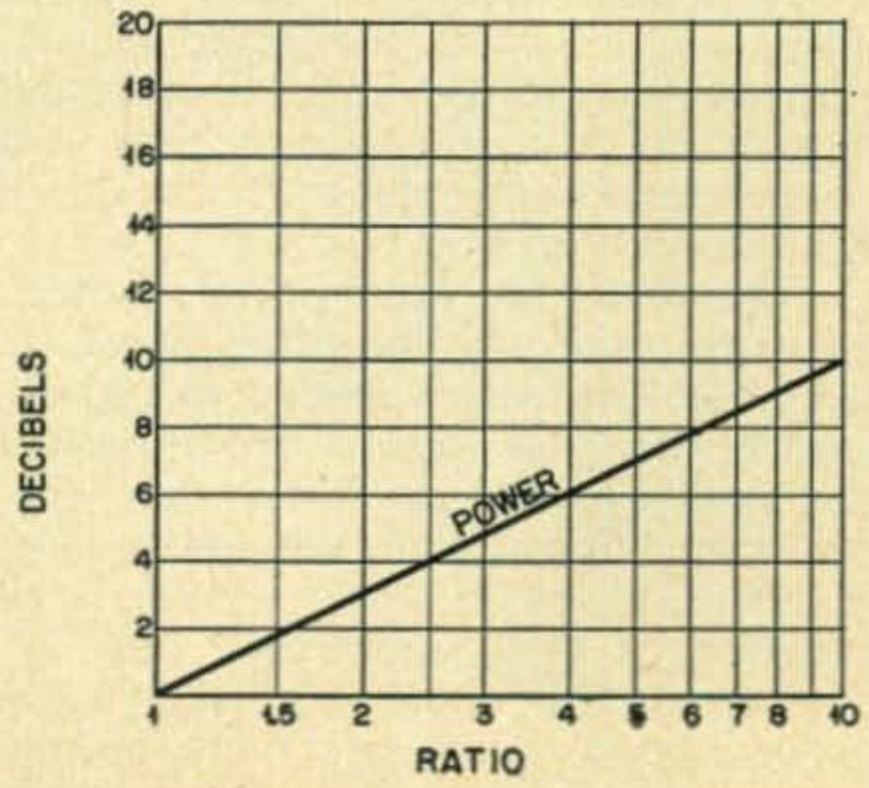
Compute Average Spacing as $\frac{.1+.1+.25}{3}=.15$

Therefore $G_p=4+[4(1.15)]=8.6$

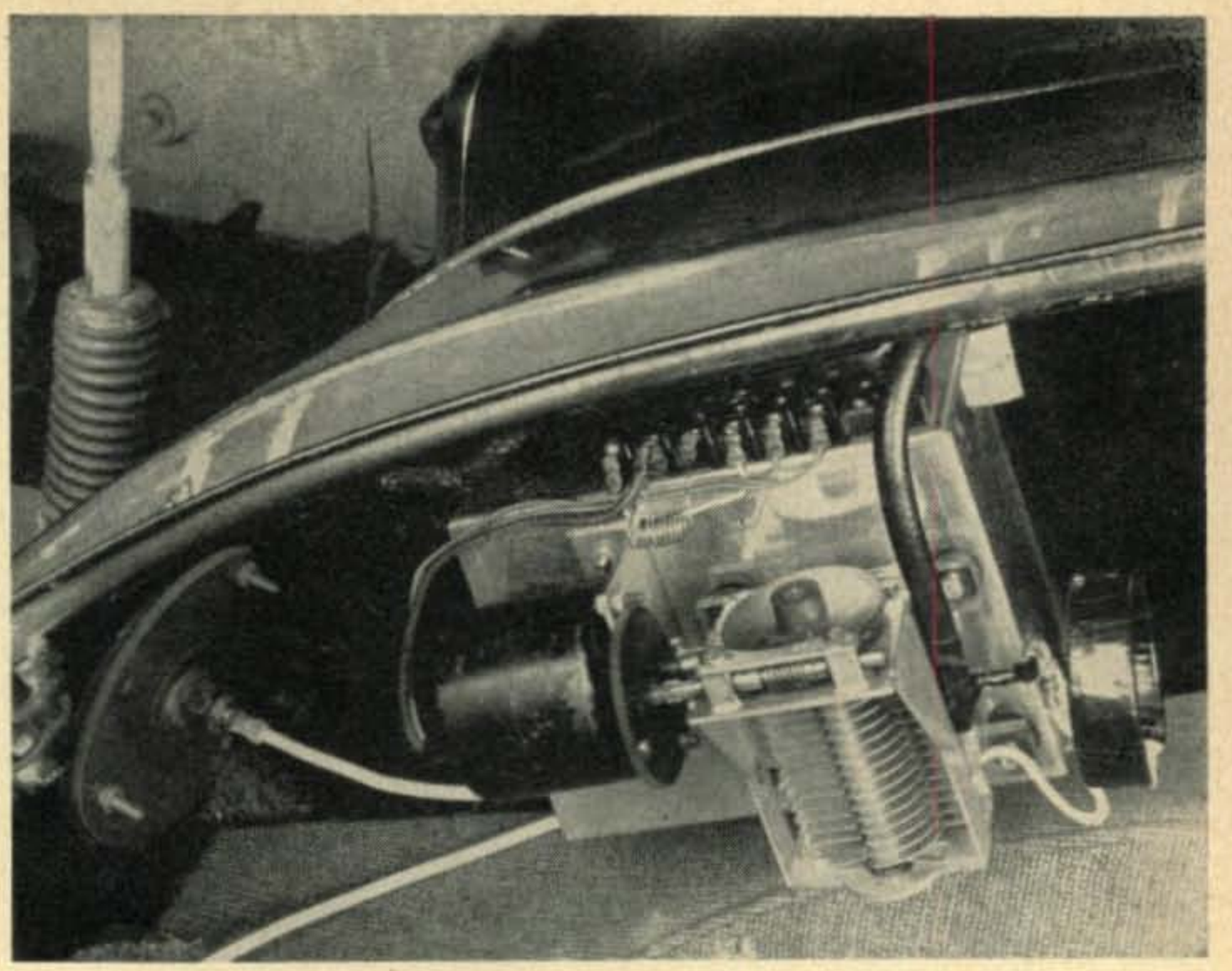
From the chart, G_p 8.6=9.3 decibels

Example 3: What is the maximum gain of a six element beam, average spacing .2?

From the formula, $G_p=6+[6(1.2)]=13.2$ or 11.2 db. ■



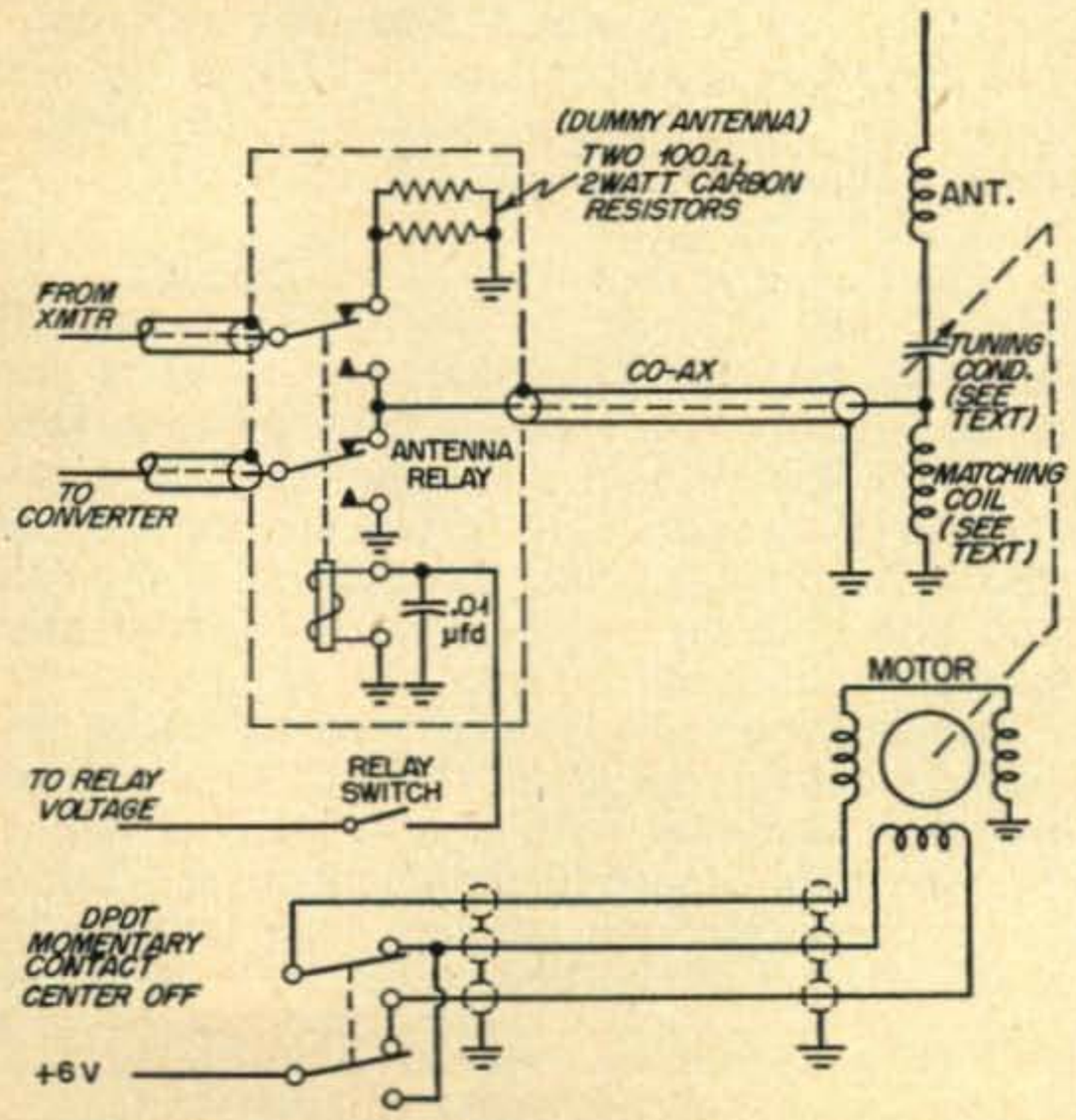
"Ham" Hamilton, W6KJJ
18908 Arlington Ave.
Torrance, California



Apparatus performing the "chop". Higher efficiency is claimed for the series tuning condenser arrangement.

Chop It, Don't Splice It

After operating on the 75 meter band mobile for some time, it was evident that some method of tuning the antenna from the front seat of the buggy was needed. All the articles that I could find on the subject used a roller coil. Two things seemed wrong with this method. First, a good portion of the most important part of the antenna is rolled up in the trunk, and second, arcing and sparking occur at the contact of the roller coil when it is being tuned. It seemed as if the fellows were like the sailor that knew if a line was too short it could always be spliced, but if it was too long he didn't know what to do. Even Marconi had the answer to this one though: If it's too short, splice a coil on the end of it; if it's too long, chop it off with a condenser. So let's try a condenser.



Remote-tuned "chop" circuit.

The ole Command Set was dug out, and **there** was the condenser, just the thing, worm gear and all. Also, since the condenser is to be insulated from ground, a fiber gear was needed. Shure enuff . . . right there on the coil was the fiber gear. The motor is a 6 volt heater fan motor that a local radio store had on special. Bringing out both the field and the armature connections made it reversible. The other smaller gear was one that happened to be around the shack, however if none is available from the junk box one could probably be salvaged from Jr's wind-up toy, an old clock, or better yet a hobby store should have quite a selection.

Tack this all down on a board, open the antenna lead at the base of the antenna, and insert the condenser. With the condenser com-

pletely closed the tap on the coil should be moved down until the transmitter tunes on the low end of the 75 meter fone band.

The rig, when tested, seemed to get out quite well and it was found that the condenser permitted VFO operation from one end of the fone portion of the band to the other.

After using this system for some time, it became obvious that it had one big fault: It was quite an ordeal to tune up. First dip the final, then load up the antenna, dip the final, load up the antenna, and so on into the night, until they both came out in the same spot. And this wasn't always the same spot for the same frequency! Soooooooooo—back to the old magazines.

First of all it was learned that a matching coil would help out by making the coax more or less flat over the frequencies to be tuned. Second, a field strength meter would show when the antenna was putting out the best. But any one knows what a meter suitable for a field strength meter costs. However, an idea was gleaned. If we are to feed a flat line of 52 ohms, we can load up the transmitter into a non-inductive 50 ohm load, then tune the antenna to match. It was found that only two 100 ohm 2 watt resistors in parallel was sufficient to make our 50 ohm load since they would be only used long enough to dip the final at about 40 watts input.

By putting the two resistors on the back antenna relay contacts they could be used to tune the final.

Tuning Procedure

Turn off the antenna relay and the final plate, zero beat the fellow, then switch on the final and dip it (using the "dummy antenna"), then turn on the antenna relay voltage and dip the final plate current again with the antenna condenser. That was it, no re-dipping the final and the same spot each time for the same frequency. The final configuration is shown in the diagram.

The matching coil consisted of six turns of plastic covered #12 house wire about 2 1/2" in diameter. This seemed to be about right in my installation to cover the 75 fone band. This might have to be altered for different configurations.

The coil just above the fiber gear in the photo is a small coil of resistance wire in series with the motor to slow it down. Also this makes the motor slow starting, so that small adjustments are made easily, and large adjustments quickly. The size of this resistor will depend on the motor, gears used, and speed of rotation that the operator prefers. In my case, it takes about eight to ten seconds to make a half revolution. (From one end of the band to the other.)

The advantages of this system were all that was wanted. No arcing and sparking of a roller contact, no costly field strength meter and a flat line because the final is tuned with a non-inductive 50 ohm load. Best of all it puts out a real potent signal. ■

The Gonset VHF Linear Amplifier

It should be no shock to you to hear that Gonset has a linear amplifier available for their *Communicator*. This accessory, for $149.50, takes the 7 watts from the Communicator and puts out 70 watts. 7 watts is all right for local communication, but when you are after DX you need something with a bit more grunt behind it. I've been using the Linear for over three months now and wouldn't be without it. With this amount of power I find that everyone I can hear can also hear me. I have a 700-watt final for Two Meters available, but until I miss getting someone I will let it sit in the rack gathering dust.

The Linear is so simple to use that it is ridiculous. The Linear is inserted between the antenna and the Communicator, with a separate wire for the receiver. The antenna relay is in the Linear and clunks in when you turn on the Communicator, disconnecting the receiver from the antenna and putting you on the air. The bulb on the front of the Linear gives positive tuning indication.

Modulation reports have been excellent, too. Someone told me that you couldn't get top notch modulation with a low level system so I have made a particular itch of myself asking for reports. No one yet has been able to tell that I wasn't using high level class B. I recommend the unit. ■

Wayne Green, W2NSD
Editor

for CW "halitosis," an easy cure . . .

Goodbye Key Klix for $1.50

Lee Shaklee, W6PQW
130 Hubbard Ave., San Lorenzo, Calif.

If a poll were taken asking CW operators on all amateur bands to name the greatest deterrent to operating pleasure, it is odds-on that the results would show key clicks to be far in the lead.

It is not my intention to indulge in a technical discussion regarding these little monstrosities. Anyone who has been blasted by them at a time when his rf gain was up and his DX decibels down will know exactly what I mean. Furthermore, I am known less for my technical knowledge than for my *Rube Goldberg* tendencies—which latter fact is a source of surprising results at times.

This is one of those times.

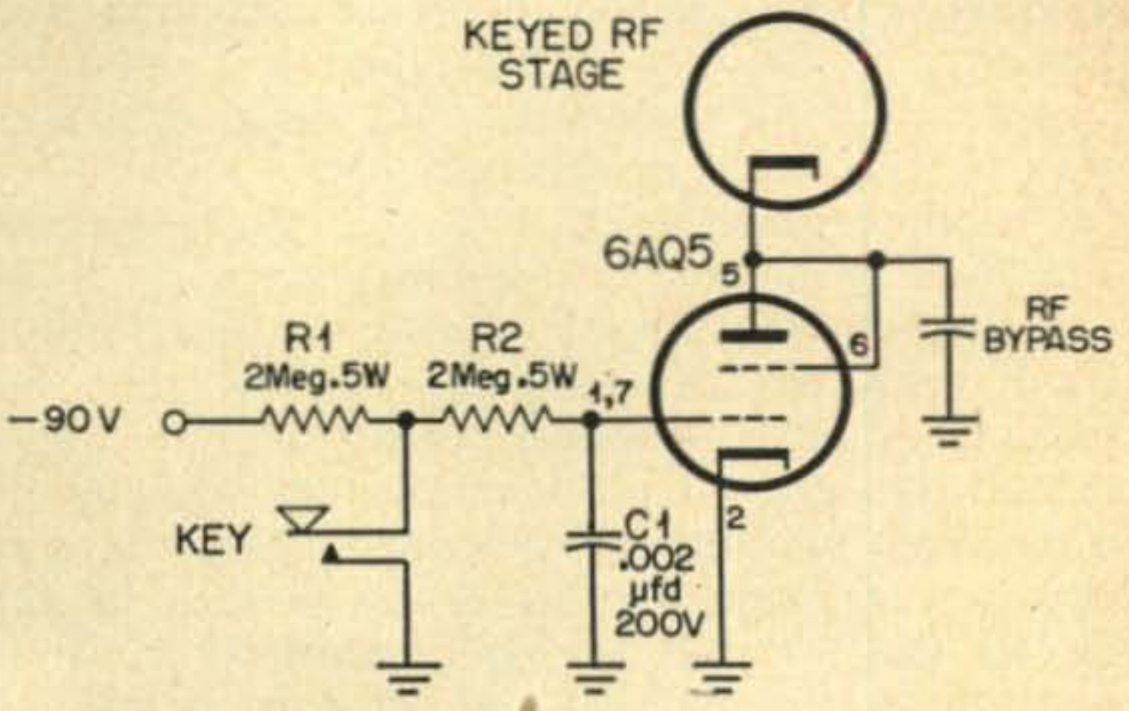
You're not the only one that's hearing them!

But, first, suppose we face a fact or two. With today's high gain, ultra-selective receivers, a keying waveform which may have passed muster in the past will now fail. It will fail in what I believe to be its most important test: that of nonhindrance with the operating enjoyment of other local hams. It is amazing how many amateurs are of the opinion that clicks from their transmitters are inevitable in their own receivers. Nothing could be further from the truth, and until key clicks are eliminated completely while monitoring with our own receivers, we can be sure we are causing trouble among others in our immediate areas. A lack of complaints means nothing. Hams are human (despite rumors to the contrary!). Valuable operating time is dissipated in calling a fellow and informing him of clicks, and he is more than likely to scoff at the report. Besides, what if our own houses are glass—? It requires a staunch spirit, or a sure one.

This matter of clicks has a parallel in advertising: *Even your best friend—etc.* It is decidedly a personal problem.

"What Circuit?" vs. $

What, then, does a newly-enlightened fellow do? The woods are full of keying circuits, most of them good or they would not have appeared in print. Unfortunately, most of them also have one thing in common—Complexity. Don't get me wrong. I think the blocking voltages and electronic switches are wonderful, even if the schematic takes up more space and seems to have more parts than my whole darned r-f section. In fact some of them are electronic marvels. Tough on the pocketbook, perhaps, but marvels nevertheless.



Could it be that, to many of us, the cost and labor involved in building keyers such as these appear prohibitive? Wouldn't it be nice if we could dig a condenser, a tube and a couple of resistors from the junk-box and be all set with perfect keying?

Well, read that last question again, because the answer is *Yes!* Not only would it be nice, but it can be done. And even if you have no junk-box, the parts will cost less than a dollar and a half in most instances.

The Choice

This circuit is neither new nor original. It is, however, a lifting of the bare essentials from a more complex design, and it will do the job you want it to do. The 6AQ5 is chosen for its current rating of about 40 mils. Several may be paralleled, of course, without affecting the characteristics of the circuit. The values as shown will be quite satisfactory in most installations, although slight variations may produce more nearly optimum results. An increase in the value of *C1* will soften both the make and break of your keying. A decrease in its value will harden them. An increase in the value of *R1* will soften the break with respect to the make. A decrease will harden it with respect to the make. In the absence of a bias supply, a 90-volt battery will last as long as it would on the shelf. Or use two 45 volt batteries in series. Then you can interchange them one at a time with the bias battery you are most likely using in your final amplifier grid circuit.

Now, lest you think this is too good to be true, allow me to point out several stumbling blocks you may encounter. Experience shows that they will not arise in most cases, but let's anticipate them just the same. Please remember

that you are doing this the easy, inexpensive way. No frills.

In the first place you will introduce bias in the cathode circuit of your keyed r-f stage. Effective plate voltage is reduced by the amount of the voltage drop across the keyer tube, while effective grid bias is increased by an equal amount. Excitation to the keyed stage may appear to be lacking. Such a fact may come as a shock if this is your initial experience with vacuum tube keyers, but the solution is simple. Merely decrease the grid leak resistor of the keyed r-f stage a reasonable degree to compensate for this fixed bias and you will be back in business.

Another point to consider is that, without the frills, you have continuing excitation looking through the keyed r-f stage into a high-Q plate tank circuit. Despite the fact that the cathode is open, leakage can result if the plate circuit is tuned to the excitation frequency. You may encounter backwave with the key up. The answer to this is to double in the keyed stage at all times, an entirely feasible procedure in most rigs and on most bands.

Which brings us to the proof of the pudding.

Testimonial

My own yardstick, in addition to my receiver, is a local friend of long standing, W6UZX. Jim is blessed with many years of experience and with a hypercritical attitude toward key clicks, and we have been close friends since high school days, which covers a longer time than either of us cares to dwell upon. In other words, no punches pulled. His verdict: Absolutely clean keying in all respects. My own receiver, antenna disconnected but with the terminals unshorted, tuned as though to copy an S4 signal, reveals no clicks regardless of the frequency to which it is tuned. At a position about 5 kc off the transmitter frequency it begins to block, yet there is still no trace of a click.

This circuit is being used by a number of operators in the San Francisco Bay Area with excellent results. For instance: W6WDF, W6KZV, K6JFZ, K6ACU, W6OJJ, among others still in the process of making the installation. My sincere thanks to these fellows for their assistance in proving the efficiency of the circuit in a variety of uses. We breathe down each other's necks out here, but cooperation is helping to make CW a pleasure instead of the heartache it can be when you lose a rare one in the mud because some guy 30 kc away makes your receiver jump into your lap.

Listen for these fellows and for others like K6DVB, W6NBD and W6JRH who are in the process. Yes, it is a personal matter with all of us. We feel that the other guy is entitled to his enjoyment, too. And, after all, a buck and a half is little enough to pay for a perpetual insurance policy of Good Will. ■

Ready to toss out that surplus rig? Maybe

Rotary Converters

can solve your problem

Many of us, at one time or another, have looked over a piece of surplus gear which could easily be adapted to the ham frequencies. We thought we had the bargain of the year until we found the 12 volt tubes, 12 or 24 volt transmit-receive relays, 12 or 24 volt band-change motors, and 12 or 24 volt dynamotors, etc.

The cost of replacing all the relays, dynamotors, tubes, and band-changing drives was just too much, so we dropped the idea of having a super, automatic electric-drive gadget.

The same kind of problem is facing a number of hams who are buying a new car. The new cars have 12 volt systems; the old rig is set up for 6 volts.

Antenna change-over relays and push-to-talk relay controls are expensive to convert to the new 12 volt system.

Well, there is a way to beat the game: rotary converters!

A rotary converter will change a d.c. voltage up or down to any reasonable value. There are a number of rotary converters on the market which perform this function. The catch is they cost lots of money, a commodity most hams are a little shy on.

A dynamotor is a form of rotary converter. It changes a low value d.c. voltage to a high d.c. voltage.

There are a number of surplus dynamotors that have dual input voltage windings, usually 12/24 volts, and are available for less than ten dollars.

If we forget about the high voltage windings, and run the primary windings like an autotransformer, we can make a good rotary converter for step-up or step-down voltage.

The popular PE-101-C is a good example. It has a 12/24 volt input. The input is really two 12 volt windings which can be connected either series or parallel. With this dynamotor we can transform 6 volts to 12 volts, or 12 volts to 6 volts. Also we can transform 12 volts to 24 volts.

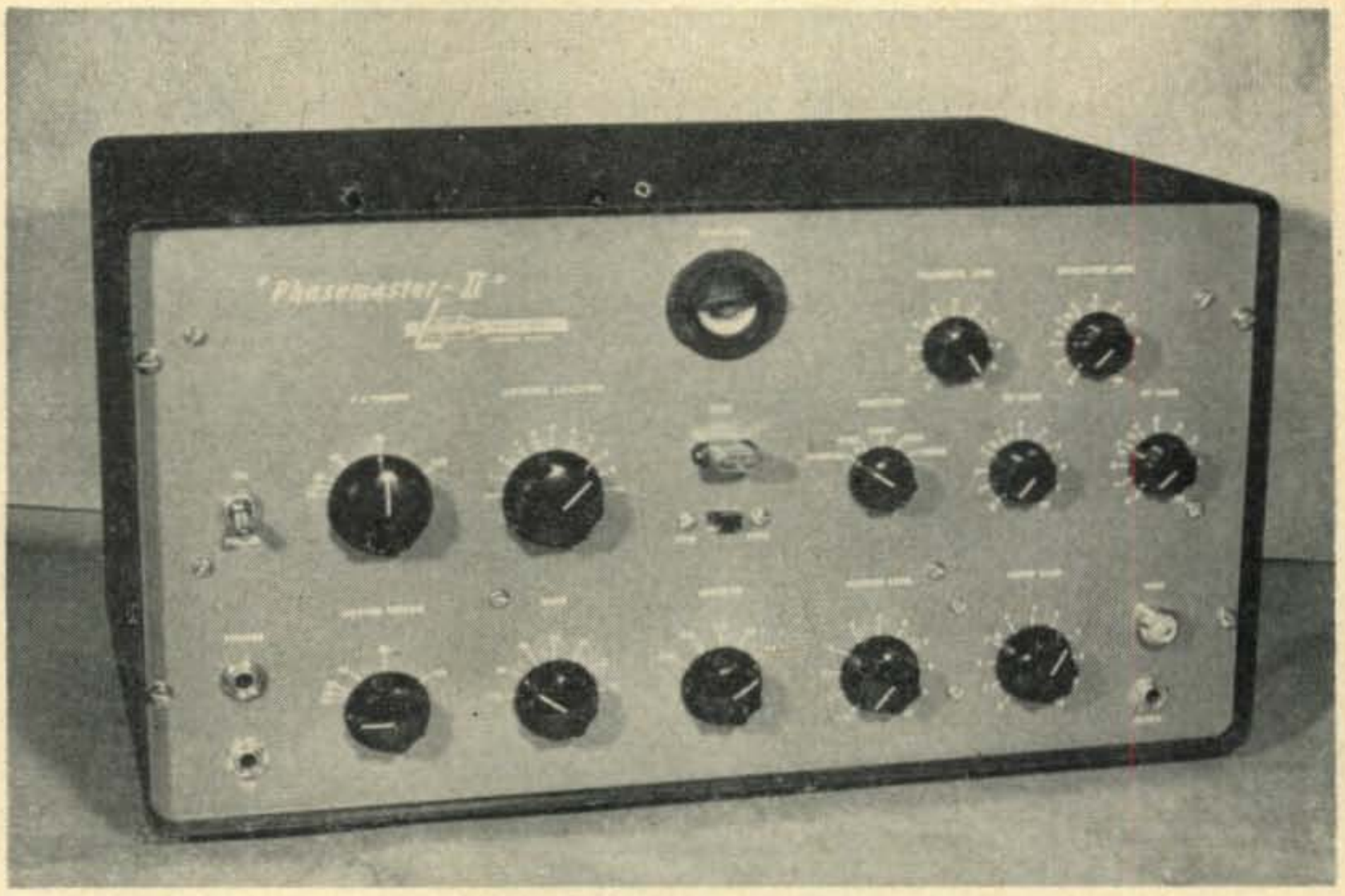
All this is at fairly high current too.

The hams who own cars with 12 volt systems are in good shape since they can transform either down to 6 volts to use their old equipment or up to 24 volts to use surplus gear right off the shelf.

The decreased overall efficiency of a system like this is far out-weighed by the economy. ■

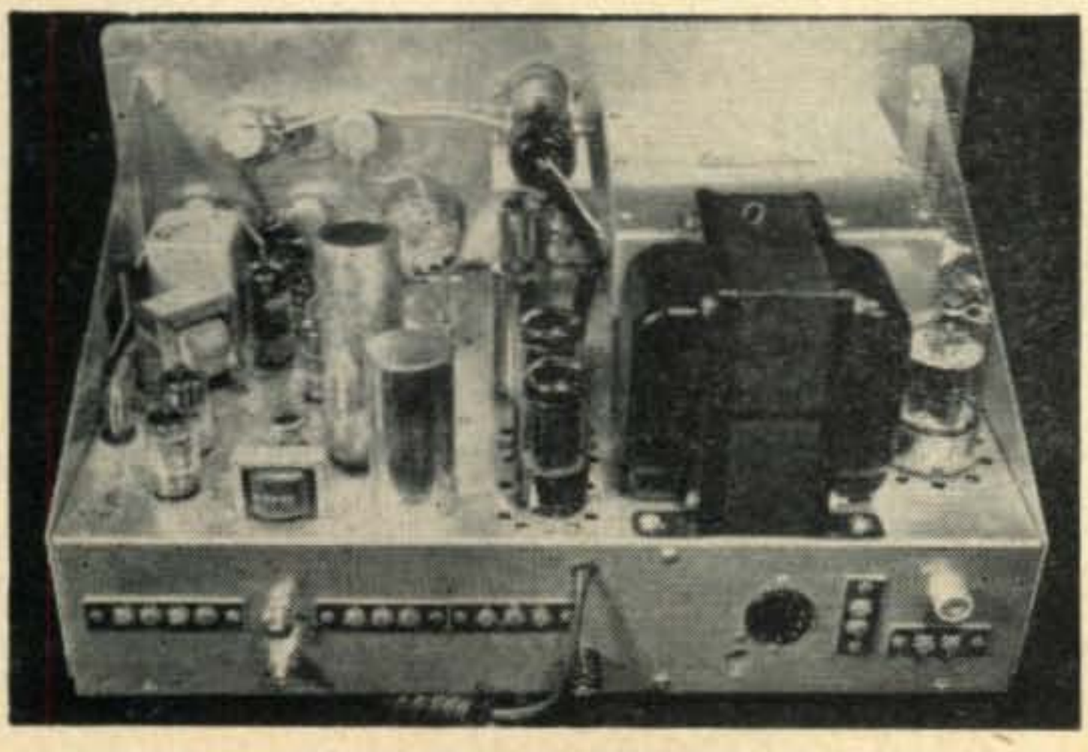
M. K. Brooks; W. Brooks, W6JAB

Wayne Green W2NSD
Editor



Testing the Lakeshore Phasemaster II

To me one of the most interesting things about buying a piece of commercial equipment is in being able to unpack it, plug it in, and off you go. With one eye on the clock and very little confidence borne of experience I unpacked the new *Lakeshore Phasemaster II* SSB Transmitter. My first impression was that whether it worked or not it certainly was a beauty, obviously commercial and not like some of the stuff on the market which looks like some hams whipped it up in the cellar.



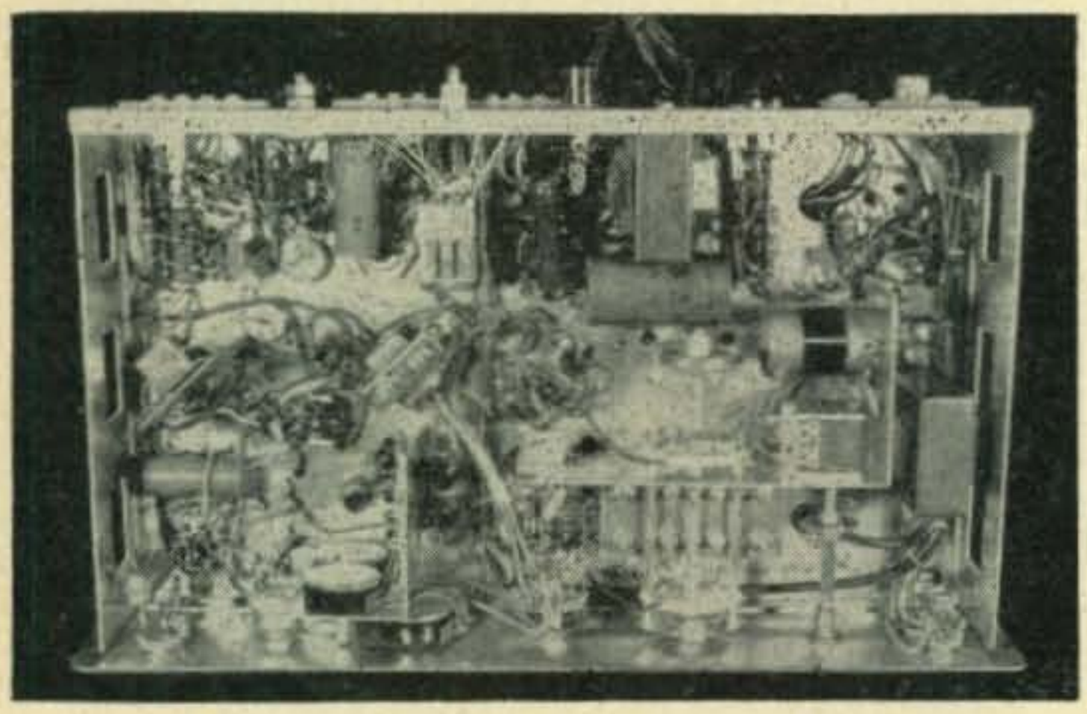
Being one to jump first and look afterward I seldom read instruction manuals. Who needs 'em? The back of the transmitter was practically alive with terminal strips and I almost panicked into checking the book, but not quite. The receiver and speaker terminals were easy to figure, I just cut the speaker line and hooked the speaker through the rig so it could cut off the receiver on voice control. Logical. Next came the antenna and the mike. No questions there either. And the a.c. plug. But E-Gad what a barrage of knobs. This stopped me cold. Turned out to be real simple after all, once I looked it up. I decided on 75 meters for the first call since this is where they put me with the crystal supplied. Fortunately there were some stations quacking away just a few cycles from my signal.

I turned the voice control knob up to where the book said and timidly said, "Hello." A voice asked, "Who's that?" and there I was, only ten minutes after opening the carton, in a 300-way roundtable with all sorts of DX, like W9's, W8's, and such. Wow! And they all heard me and insisted that my rig sounded wonderful.

Once the first glow died down and I began listening around a bit more I found that a

crystal is OK for that first ice-breaker, but to work SSB you got to have a VFO. Lakeshore had already noticed this and I found, included with the instructions, a promise of a VFO to soon be made available by Lakeshore. They also sealed the doom for any possibilities they might have had for a sale of this coming VFO to me by including complete instructions on the conversion of the BC-458 for the purpose. I had one around and by the next night I had it perking and me jumping from one roundtable to another on 75.

As long as 75M was working so well why not give it a try down on twenty meters? I got out some twin-lead and string and thrashed around



Bottom view, Phasemaster II chassis.

in the icy midnight darkness until I got a folded doublet up in the air. Then I hooked in the *Harvey Wells* Z-Match Antenna Tuner and tuned up the rig and antenna until I was getting as much out of the unit as possible.

Not hearing any stations I took the bull by the horns and called a CQ. I hoped that some local would give me a call and let me know that everything was working well. When I stood by on the band there was a station calling me right on the frequency. Honest, it was ZL3AR! Ask him if it wasn't. He gave me a five nine plus and we talked for fifty minutes before running dry. I then called ZL3IA and got a nice signal report from him on my first call. Naturally both of these stations were SSB too. If this Phasemaster II will do this for me running barefoot with a hastily thrown up folded dipole what will I be able to work with a good linear amplifier and a beam? I'll let you know how that works out for that won't take long.

The next evening I heard ZL3AR coming through again and he came right back to my first call. That certainly gave me quite a feeling. We again chatted for a while with no difficulty. Signing with Dave I tuned up the band and heard KL7AOP. Expecting nothing, but willing to try anything I zero'd in and spoke up. No strain. About six o'clock the next evening, right in the middle of the worst QRM, I called in on a lebenty-way round table and got glowing reports from all over the country plus KH6CT. A round table the next night netted HR2WC and KV4BB plus several 4's. From then on there was no stopping me. CN8GD came back to a CQ, I1BAO gave me 5-9, as did VK3AEE and F7EM called in on a QSO with W4JIT in Sarasota. My log was beginning to look the way it does when I run a kilowatt and a beam.

The real capper was my regular sked with Dick, KV4AA. I usually run about 800 watts AM for that path and we manage to eke out a fair QSO between the QRM'ers. This time I shifted to the *Phasemaster II* and thundered my mighty 25 to 30 watts at him. Dick was astounded. This was the first really QRM-free QSO we had had. Apparently it made quite an impression on him for the last I heard he had a sideband exciter being shipped down to him by air so he could get on SSB.

Sam, W1FZJ, our VHF expert was down here for a weekend and naturally I wanted to put on a good demonstration for him. Under normal circumstances this should have been adequate reason for IPOIO to set in and louse things up. As we tuned in on 20 I heard ZL3AR again. I said, "Hello Dave." That's all it took. Sam and Dave talked VHF for about a half hour. Dave asked if I would go up to 75 meters and explain to a net up there that he had suffered some deliberate QRM and had had to shift bands. Without much hope of getting the W6's mentioned I tuned up on 75. With the first call I got K6PSV and the net and explained what had happened to ZL3AR!

So much for the performance. Reports invariably indicate that the voice quality is excellent. No one has been able to detect the rejected sideband and the carrier is balanced out beyond detection. All in all the comment of a W8 seems to be apt, "The Phasemaster II really puts out, we're very fond of it."

Constructionwise the pictures speak plainly. The phase shift network is printed circuit design and thus affords compactness as well as reliability and uniformness. The voice control unit works well and no difficulty was had in setting up the anti-trip operation so the output of the receiver wouldn't trigger off the voice control. No difficulty has been had with TVI despite the hundreds of sets in the close vicinity. Normally a new rig starts my phone ringing for several days.

What more do you want to know? The Phasemaster looks nice, works nice, sounds nice. The 6146 class AB_1 output stage will poke a signal anywhere in the world with just a little bit of antenna help. In this way it is about the same as c.w. The pi-net final not only helps tune up most antennas, but will be of great advantage in matching the input impedance of your linear when you go to higher power. It has a phone jack on it in case you are an earphone type operator. It will put out well on c.w., phase modulation, amplitude modulation, or on either sideband. There is also a special jack for hooking in a phone patch. ■

A meter for every circuit

Edward J. White, W1NPL
136 Woodlawn Street
Chicopee Falls, Mass.

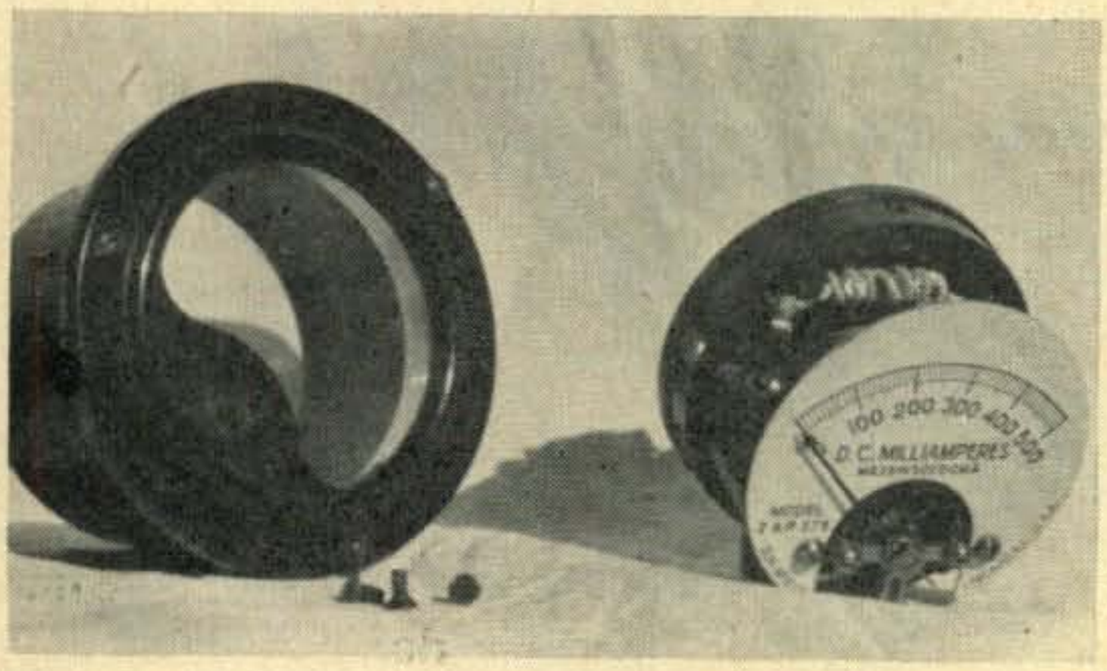
Flexiblizing Meters

by Decreasing their Maximum Reading

The dyed-in-the-wool home constructor of ham equipment invariably encounters this problem: how to change the maximum scale deflection of the plate or grid milliampere meter available, to a lower current reading.

Many articles have covered the conversion of milliampere meters to a higher current scale and is adequately explained in most text and handbooks; but there seems to be little information on the reverse procedure.

Most meters in the 50 to 500 milliampere range have a basic 5 mil movement. An internal low resistance shunt is across the meter coil, allowing a multiplier to be used when reading the scale. This is usually the printed scale thus requiring no mental calculation.



Original internal seven turn shunt coil behind dial face. Disconnect at one end.

If we want to reduce the maximum current reading at full scale deflection, for example, from 500 to 100 milliamperes, it is first best to determine the meter's basic movement. To do this remove the three (or four) small screws on the outside of the meter case near the rear edge. This should free the meter assembly. Be sure the meter is withdrawn from its case straight out, with no side movement, so the zero set mechanism will not be damaged. Steady does it.

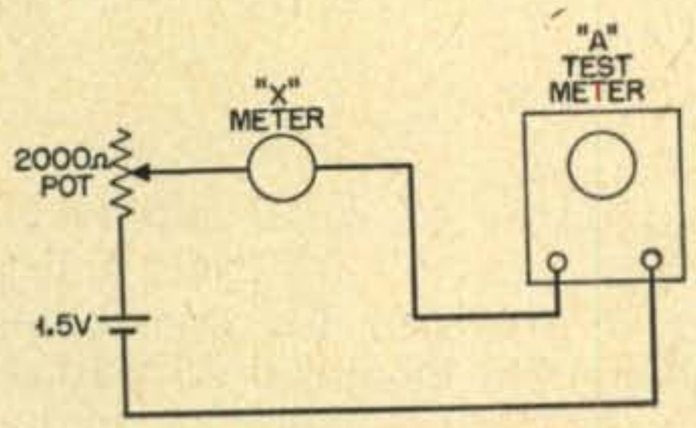


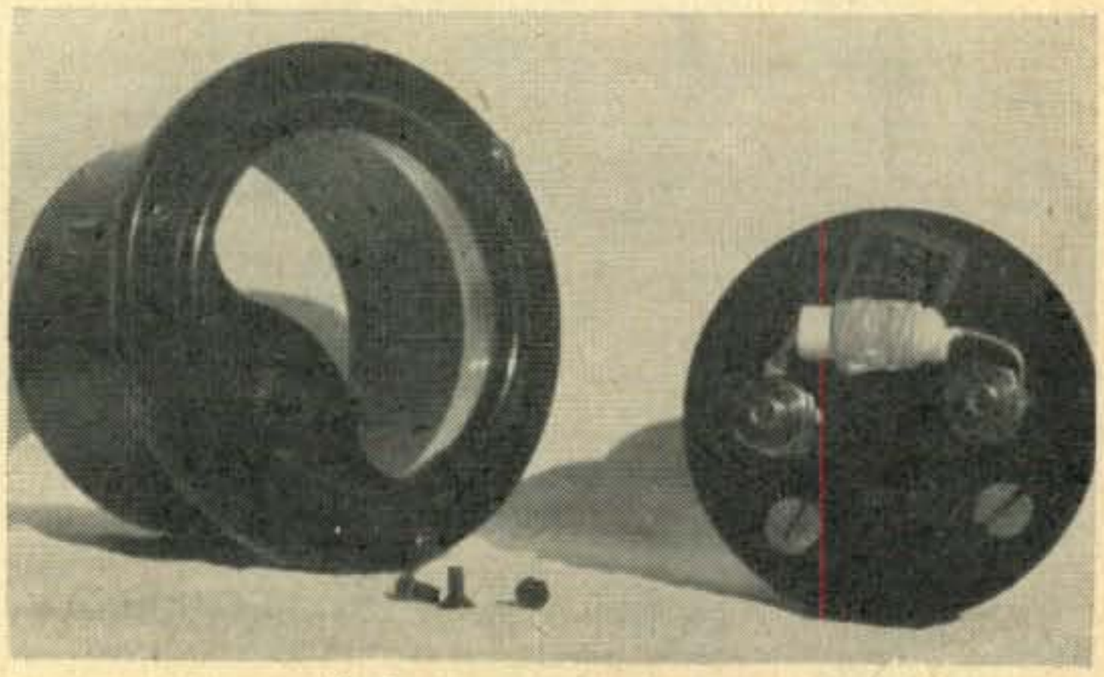
Figure 1.

Inspection of the meter will show the coil across the meter terminals. In some meters there is a series coil of a few turns, but this should not be touched. Remove one end of the shunt coil. This can be unsoldered or cut depending upon the working area. The coil will support itself with one end free, allowing you to leave it in the meter in case you ever desire to restore the meter to its original movement.

Removing one end of the shunt reduces the meter to its basic movement. To find out just what this basic movement is, the circuit as shown in *Figure 1* can be used.

Before setting up the test circuit be sure that

[*Continued on page 106*]



New external shunt made from a TV receiver peaking coil reduces the current range.

a pre-FD special . . .

Automatic Voltage Regulation of Small Gasoline Driven Generators

Charles R. Hewson, W1HJP

In the majority of small (up to 5KW) gas engine driven 115 volt 60 cycle generator sets no means is provided for controlling output voltage other than by speed adjustment on the engine. This of course varies the frequency and while it may be adequate where the load is constant and not dependent on frequency, such as a lighting load, is a poor and dangerous situation where the operation of appliances and in our case radio equipment is concerned. The reason for this is that speed of a-c motors varies directly with frequency and excitation current on motors and transformers varies inversely with frequency. This means that most of our radio equipment designed for 60 cycle operation will overheat on low frequency supply current. Furthermore the governors on the engines are not very good resulting in a considerable rise in voltage due to speed rise when portions of the load are removed. This naturally imposes extra stress on radio equipment and encourages instability.

Voltage regulation might be defined as the percentage of voltage variation between no load and full load referred to full load voltage.

As a formula:

$$\frac{\text{Volts}_{\text{no load}} - \text{Volts}_{\text{full load}}}{\text{Volts}_{\text{full load}}} \times 100 = \%\ \text{reg.}$$

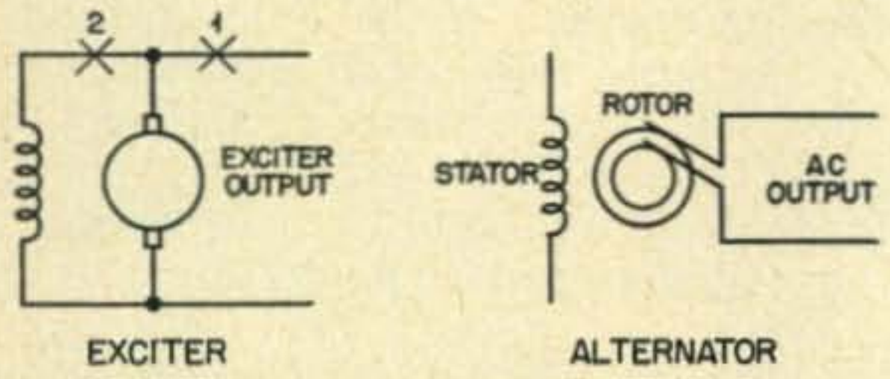


Fig. 1. Generator and Exciter

In order for us to understand the problems involved in the application of voltage regulation to generators it is necessary that we have a fairly good understanding of generators or more correctly alternators.

Thomas Edison built the first alternator and didn't know it until several years later. With the exception of the Faraday disc dynamo, all rotating generators generate alternating current. The addition of a commutator (which is actually a rectifier) to an alternator makes it a direct current generator and that is what Mr. Edison was looking for in his time. Generators essentially involve a loop of wire the two ends of which are connected either to a commutator or slip rings revolving in a magnetic field. Motion thru this field cuts lines of magnetic flux and induces current flow in the wire. In d-c generators the field is stationary and the armature is rotated by the prime mover. In small a-c machines such is frequently also the case, although in these it doesn't make any difference whether the field rotates and the armature remains stationary or vice versa. For this reason in a-c machines we speak of the rotor and the stator. In larger a-c machines it is electrically and mechanically more feasible to

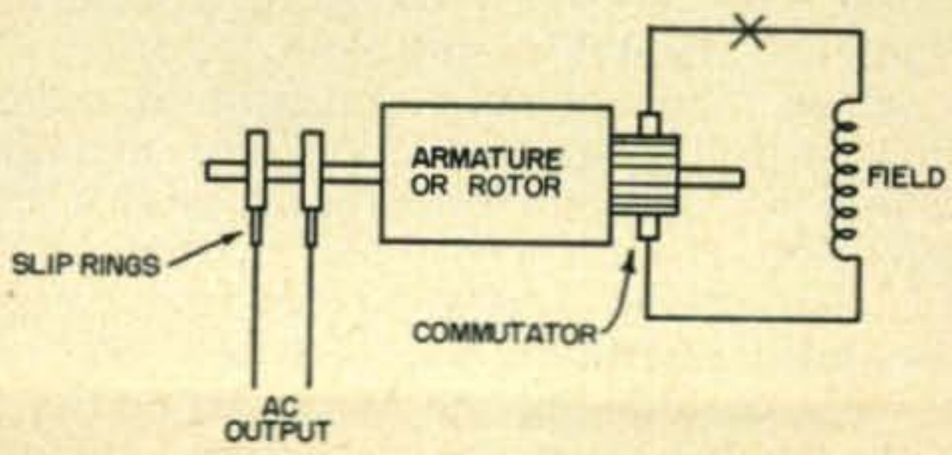


Fig. 2. Altemotor-type generator

rotate the field and this is the way all large a-c generators are constructed.

By now I think the reader realizes that in an a-c machine something is required to create the field. Either permanent magnets or wound field pieces are required. Where control of voltage is required it is most common to use wound fields because by controlling current thru these windings it is possible to control the field strength and hence the output voltage of the generator. This energy supplied to the field is called the excitation and the unit providing the excitation is called an exciter. The power required of the exciter runs from around 25% of full load generator output for small units down to around 10% for larger machines. The principal difference here is due to the lower efficiency of small units.

Figure 1 shows a typical set-up for a generator and its exciter. Understand the exciter and alternator though not indicated as such are belted or direct connected to the engine. Since most of our experience will be with machines which are small and where the field will be stationary, imagine the exciter output connected to the stator. Points X_1 and X_2 are places in the circuit where rheostats may be inserted for the purpose of controlling output voltage. X_2 is the preferred location since exciter field current is considerably smaller than the main field current and a smaller capacity rheostat is required.

*Figure 2 s*hows the Altemotor type of generator which is found only in smaller sizes of say up to 5 KW. In this arrangement two windings are put on the rotor. One is an ordinary d-c winding which terminates in a commutator while the other is the a-c winding which is connected to the slip rings. The field in this type of unit is common to both windings and presents a little bit of a problem in that its current is considerably higher than that of a comparable generator built for separate excitation. There are two reasons for this as follows:

1. It is supplying the field for two generators
   (Main plus exciter)
2. Such an arrangement is lower in efficiency

(Efficiency is sacrificed for simplicity and compactness)

The point marked X here is where a rheostat is inserted for voltage control.

Now in both cases we have said a rheostat could be inserted but what size? The size depends on where the rheostat is inserted and the amount of resistance required to give rated voltage at *no* load and the amount of current required to give rated voltage at *full* load. While some of the information required may be given on the nameplate, it is advisable to determine these values experimentally. To start with it is necessary to determine the field current at the point where it has been decided to insert the field rheostat. On units up to 5 KW it should be safe to start with a 10 amp d-c meter. Insert the ammeter and then start up the engine, watching the current build up as the unit comes up to speed. If the needle comes up so fast that it looks as though it has no intention of stopping before it hits the pin, shut off the engine, or provide a convenient means of shorting the instrument. It might be wise to insert a word of

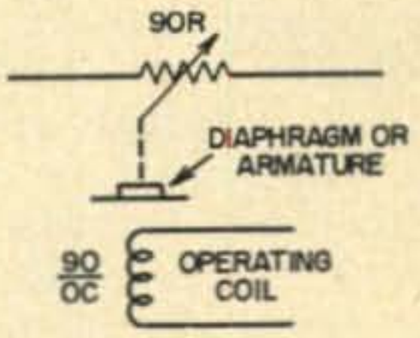


Fig. 3. Voltage regulator

warning here about opening field circuits. Because of the high inductance of fields large voltages appear across a break in the circuit as the flux decays toward zero. In practice a field discharge resistor is provided wherever a field switch is used. This resistor is connected across the field automatically by an auxiliary contact of the field switch just before the circuit is opened. This protects both the contacts of the switch and the insulation in the field windings. For small units a field switch is not required but while experimenting to determine the size of the rheostat keep these points in mind.

Adjust the engine speed to give as near 60 cycles as possible, and then read the ammeter. If a frequency meter is not available, an electric clock will do as well for our purposes. An oscilloscope works well to compare generator output frequency with the a-c line voltage by feed-

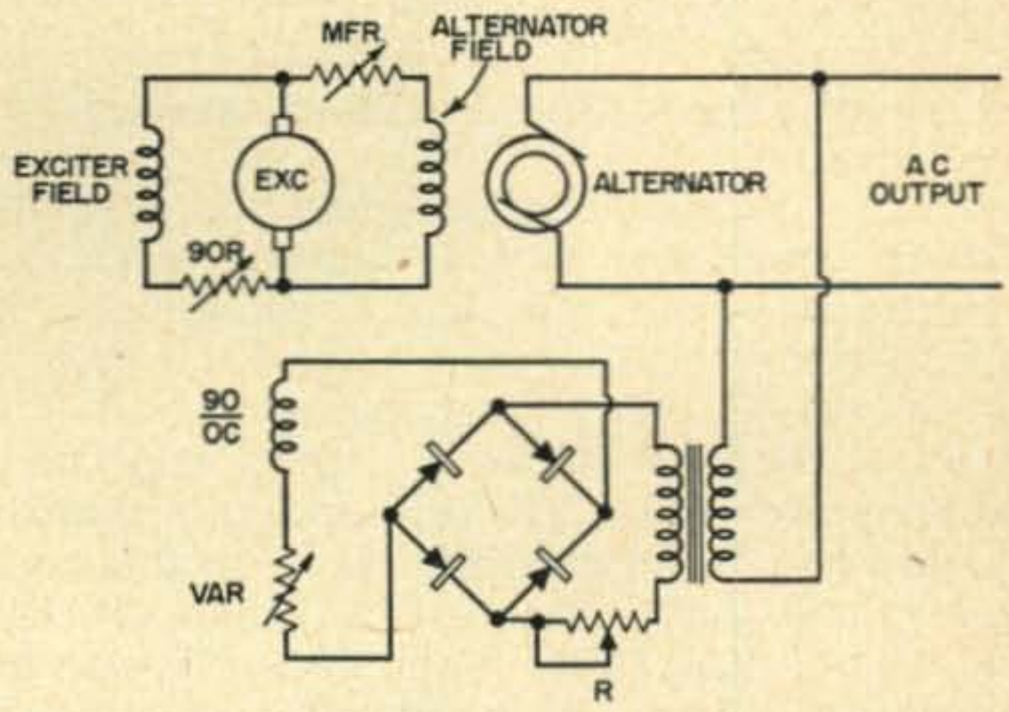


Fig. 4. Generator-regulator (see text)

ing the house current thru a filament trans. to the horizontal input and the generator output into the vertical. An ellipse standing still indicates synchronism.

This field current read is the maximum field current which will be present at 60 cycles, and is the maximum current the rheostat and later on the regulator resistive element will have to carry. Now measure the resistance of the field. If, while the generator was up to speed, the voltage across the field was read, the field resistance may easily be calculated by: $R_f = \frac{E_f}{I_f}$

This will give us an approximate value of rheostat to use. Very likely you will find that a rheostat having a resistance equal to about half the field resistance will give sufficient range of voltage adjustment.

Now that we have determined the size of field rheostat and have it installed it will be found that reducing the resistance increases the voltage and increasing the resistance reduces the voltage. A voltage regulator of the type we will discuss here does the same thing automatically. Schematically a voltage regulator is quite simple as illustrated in *Figure 3*. The operating coil operates an armature of sorts which is mechanically connected to the resistive element such that if the operating coil current increases, the resistance will be increased and vice versa.

The only regulator the author was able to obtain after writing letters of inquiry to many surplus suppliers who advertise in the radio and amateur publications was a Leland carbon

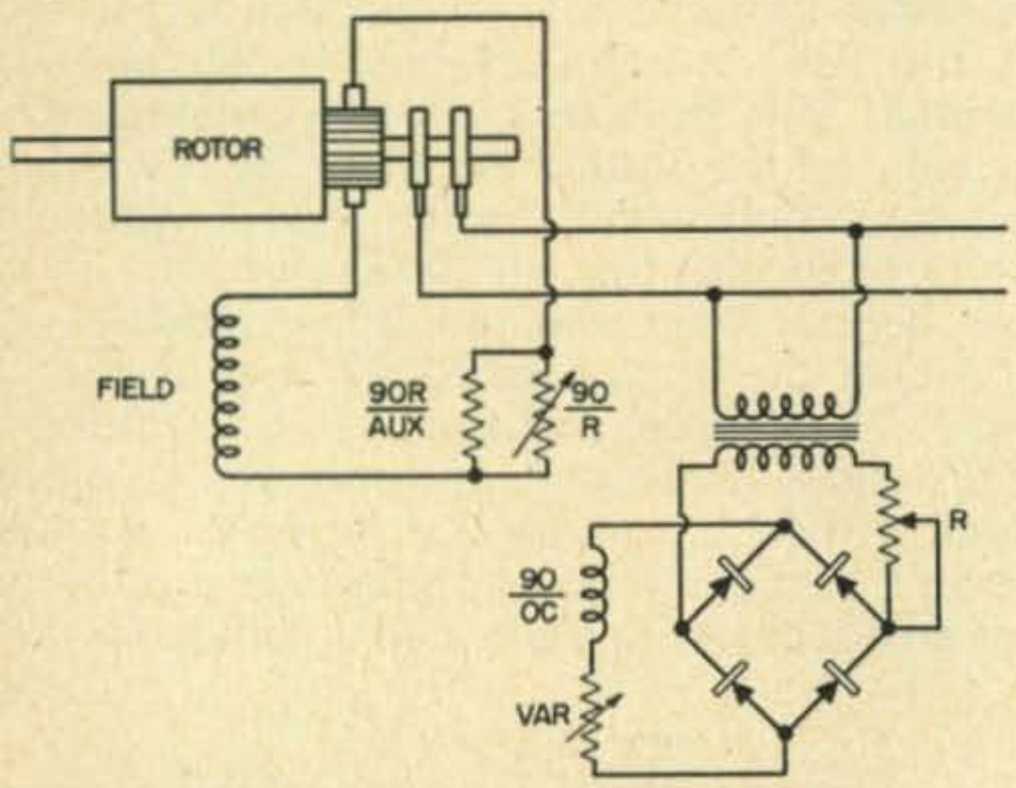


Fig. 5. Semi-schematic of Altemotor

pile type of regulator designed for regulating aircraft generators. G & G Supply, N.Y., N.Y. was the only one who had these though they have a rather healthy supply, and sell them for around $3.00. They have operating coils rated at about 20 volts and have a rated field current capacity of 5 amps. The author found that they would carry 10 amps. quite nicely so this makes them applicable to most of the small generator sets up to 5 KW anyway and depending on field current they would probably work on somewhat larger sets. There are several other types of voltage regulators which may become available soon. The General Electric Type GBA, a multiple contact type, while somewhat different from the Leland can be made to work very nicely in this application. Should a reader obtain such a regulator, the author will be glad to submit suggestions and instructions on how to make this type operate.

While one might think the 20 Volt operating coil of the Leland offers a problem in regulating 115 volts a.c. it is actually a very simple problem. The 115 v.a.c. is stepped down thru a suitable transformer and rectified to give around 25 volts d.c. at about .5 Amps and then supplied to the operating coil thru an adjustable slider resistor. The resistor supplied with the Leland is suitable for this purpose.

In the Leland the operating coil works on a diaphragm, on the other side of which is the carbon pile comprised of small carbon discs about ⅜" in dia. and about 3/32" thick. There must be about 20 of these discs piled one on top of the other. Varying the position of the diaphragm, varies the degree of compression on this pile and thus varies the resistance. The enclosure for this pile is fitted with fins to dissipate the heat developed in the pile.

In order to control the point at which the regulator will regulate, a voltage adjusting rheostat of 100 ohms, 50 watts was inserted in series with the operating coil, providing a regulating range of about 15 volts which should be adequate. Resistor R serves as a course voltage adjustment to bring the voltage supplied from the rectifier into the regulator range.

Figure 4 shows the regulator connected into the circuit of a generator and separate exciter sort of set. It will be noted the regulator resistive element it inserted in the exciter field. MFR is a main field rheostat which may or not be necessary, depending on the exciter characteristics. Sometimes this is required to establish exciter operation on the linear portion of its load current vs. field current curve.

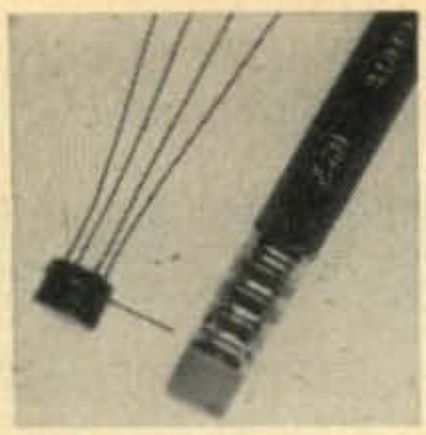
The author has this arrangement working very nicely on a home made set comprised of a 2 HP Montgomery-Ward engine, an old rewound Dodge truck generator and a Delco automobile generator used for an exciter. The exciter was a three brush type. The third brush was discarded and the field was connected thru the regulator to the brush the third brush used to be moved toward to increase charging rate. The set is good for 1 KW.

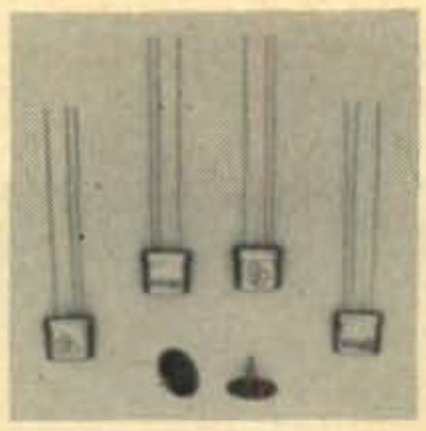
Another type of generator to which this system was applied is the rather common surplus Army Lighting Generator of 2½ KW capacity. For a generator this has a Leland Altemotor and is shown in *Figure 5*. This is the Framingham Radio Club Emergency Power Unit mounted in a Crosley Station Wagon which has been made over by the members into a trailer.

At no load this unit put out about 145 volts and to no end of anxiety on the part of club members who donated their equipment to field day use. With the regulator she holds a steady 115 volts from no load to full load.

Here the regulator components have been prefixed with the number 90 which is the standard switchgear and control nomenclature for a voltage regulator. $\frac{90}{OC}$ is the operating coil, 90R is the resistive element. It will be noted there is a $\frac{90R}{Aux.}$ resistor added in shunt with the resistive element. This is to carry some of the

[*Continued on page 118*]





Learning what not to do is as important as learning what to do—Lesson from History

Limitations of Transistors

John W. Campbell, Jr., W2ZGU
1457 Orchard Rd., Mountainside, N. J.

Transistors now reaching the market have come down in price to the point where hams can—and should—experiment wtih them. But there's no use wasting your time, effort, money, and equipment trying to make a transistor do a job it is inherently incapable of doing. Any piece of equipment, of any nature whatever, has *some* limitations. Someone has pointed out that Science advances by discovering what *can't* happen, as much as by discovering what *can* happen. There's a great—and very valuable—human tendency to hate limitations, to insist "that's what *you* think—it doesn't keep me from doing what you say is impossible."

OK—it's a fine and useful tendency; it's what makes for progress. But let's also note that some darned useful gadgets depend on discovering what can't happen—and using the fact. The very handy little VR tube series, for example. You *can't* get a voltage over 75 volts across a neon-filled gas discharge tube of that design, once the arc has started.

866's depend on the fact that you *can't* get more than about 15 volts across an ionized column of mercury vapor—and that you *can't* break down a column of mercury vapor as little as a third of an inch long, even with several thousand volts, if the mercury isn't ionized.

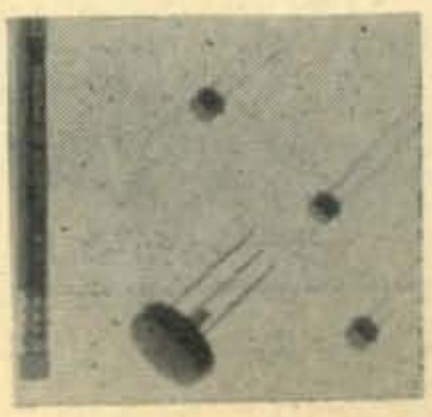
Limitations are useful—when you can figure out how to make the impossibility act to produce an effect you want.

If you learn the inherent limitations of the transistor, it'll save useless experimenting—and may suggest ways of using that very limitation to produce a desired effect.

First, transistors work because of a limitation; they're possible only because of one of those *can't*'s science discovered and put to good purpose.

In copper (or any of the metals) an electron can have *any* energy with respect to a copper atom. It can be deep in the electron-ring structure, or out on the outer edges of the electron rings, or even hanging loosely half way between two or more copper atoms. Copper, you might say, acts like a sort of public play ground; any kid electron in the neighborhood is welcome to come, stay, go, visit once in a while, or play every day all day long.

Germanium (and silicon and some other



atoms) have a sort of Private Club arrangement. An electron is either *In*, or it's *Out*. Electrons are either In the electron ring structure, or are held in an Out position far out on the fringes. They can stand outside the fence and watch the ones that are In, but can't get In themselves.

In terms of quantum physics, there are permissible energy levels in the valence rings, and permissible energy levels at the conductive band, but there is a forbidden band of energy levels separating the two. Electrons *cannot* slip into germanium atom structures as they can slip freely into and out of copper—and because of that *can't*, the transistor is possible.

In a vacuum tube, electrons in a metal wire are boiled out into the vacuum by heating the wire (or from an indirectly heated cathode). An electron in a vacuum is a conspicuous anomaly; it's a lump of Something in a huge volume of Nothing. It's different, and detectable, and it can be influenced as an individual entity. An electron cozily snuggled into the vast horde of other electrons in a copper wire can't be detected or influenced as an individual. Try to apply an electric field—and the whole mob surges toward it *en masse;* you can't work on them as individuals.

But once an electron has been boiled out into the vacuum, it can be influenced individually. You can apply a voltage across the vacuum, and the electrons will respond on a *limited* basis. Not all the electrons in the cathode come surging across—only some of those that have been boiled off.

The electron in the vacuum can't get back out of sight, so to speak, by slipping back into the vast horde of twin brothers; in a vacuum, there's no place for it to duck out of sight.

In germanium a similar situation exists. If an electron does get injected, somehow, into the conduction energy level in a mass of germanium . . . it might as well be in a vacuum. It can't duck into hiding, because it's Out—it's Outside the forbidden-band energy fence. It's rather in the position of one of these water-spiders that runs along the surface of a pool of water, by stepping on the surface-tension of the water. The electron injected into germanium is running across a surface-tension in three dimensions, bumping along from one fenced-off atom to another, trying to find a place to duck down out of sight again.

And so long as it's stuck there, unable to duck back in, it acts very much as an electron in a vauum tube does; it'll respond to electric fields.

All the electrons in a copper bar will respond to electric fields, too, of course—but the trouble is, they *all* do, and there's so gosh-awful many. If you have a copper bar ¼" in diameter, and ¼" long, say, imagine what would happen if you *did* succeed in getting an electric field of, say, 50 volts across it! You'd get a current made up of uncountable sextillions of electrons, and you'd get it *right now*. The result would be an explosion of a violence approaching that of an atomic bomb.

The value of the germanium limitation is that *some*, but not *all* the electrons present can be made to react.

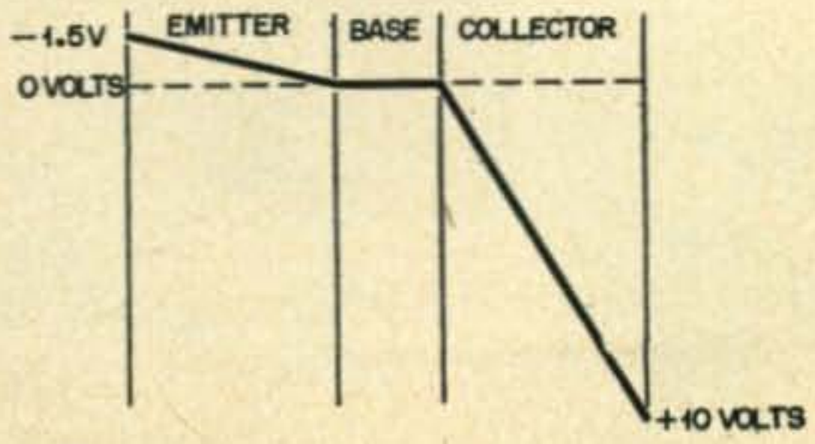
In pure germanium, theory suggests that there would be no useful conductivity. Germanium that pure can't be prepared—which is all right, because we want slightly impure germanium anyway. Since that forbidden band *is* forbidden, there wouldn't be any conductivity electrons at all in pure germanium—but by adding some impurity that does have a conductivity possibility, about one atom of impurity per million germanium atoms, some electrons can be introduced into the mass of germanium.

The electrons rolling around on the surface-tension effect of the germanium atoms now act like electrons in a vacuum . . . with one critical exception. They bump their way from one place to another. The transistor material acts somewhat like a sort of pin-ball machine, with pins being germanium atoms, and electrons being the balls. The pinball machine has to have a tilt, to make the balls tend to roll down from one end to the other; the applied electric field supplies this effect in the transistor. The pinball machine has an "injector," spring-operated, that shoots the balls in to roll down the slope, bouncing from pin to pin.

This bouncing from pin to pin—the electron bouncing from germanium atom to germanium atom—has a critical effect in limiting the possibilities of the transistor. In a vacuum, when an electron starts going toward the plate, it keeps going in that direction. It builds up momentum, and travels along like a bullet.

The pinball machine effect in germanium prevents an electron's building up momentum. If it builds up too much of a kick—if too strong an electric field is applied to accelerate the electrons—they will break through the forbidden band, and you cease to have a transistor. Get real anxious to haul electrons through, and ram on the voltage, in other words . . . and you get electrons through, all right, but you don't have a transistor any more.

But the thing that really causes trouble is the base of the transistor. Let's say we apply 1½ volts bias from emitter to base, and have 10 volts from base to collector. We could diagram the electric field system like this:—



The slope of the electric field from emitter to base causes the electrons to pinball their way steadily toward the base, bouncing along in the desired direction. Once they get beyond the base, they drop rapidly toward the collector, urged along by the 10-volt field.

But . . . there's nothing to make them cross the base! They slide off the emitter-base electric-field slope, pinball against a few germanium atoms, and then just sort of lie there with no goal, no purpose, and no action. Some actually succeed in finding "holes" to fall into, and disappear in the base. The rest tend to act somewhat like a New Year's Eve crowd in Times Square; they mill around, step on each other's toes, but they have no tendency to go anywhere in particular. Because the electric fields can only be applied between emitter-and-base, and base-to-collector—there cannot be a field across the base itself.

In a grounded-grid *vacuum tube* circuit, the grid is at ground potential, the plate is positive, and we may have the cathode negative to grid. But there's no voltage difference within the grid; there can't very well be, since the grid is a single unit of nearly-perfect conductive material.

Grounded-grid amplifiers work happily up to 3000 megacycles—because the electrons coming from the cathode arrive at the grid region with momentum, and shoot through at enormous speed.

But in a transistor, the electrons coming from the emitter arrive at the base with no momentum. If they did have momentum, they'd lose it by pinballing their way through the base atoms.

The electrons cross the base all right—but by a process known as "a random walk" or "the drunkard's walk." The latter term stems from the original consideration of the problem in these terms: suppose you have a drunk, completely soused, and operating in a state of the blind staggers. Any step he takes is a pure accident, because he's too drunk to know which way he was going, which way he is going, or which way he wants to go. If he gets anywhere, it's by accident, pure chance.

Let's say he has passed out at the foot of a lamp-post. Then he comes to enough to start his blind stagger. If he takes one step every three seconds, and each step is 18 inches long, how far will he be from the lamp-post after 10 minutes? Since no two steps have any predictable relationship to each other, he's just as apt to walk toward the lamp-post as to walk in any other direction, so it won't be 60 x 1/3 x 10 x 18 inches; it'll be a lot less than that.

The problem can be solved mathematically, on a statistical probability basis.

Trouble is—the electrons in a transistor base all act strictly on the totally-soused basis. They don't know where they've been, don't care where they are, and haven't any mind to go anywhere.

Meanwhile, we're waiting for the little rascals to arrive at the collector with the message from the emitter. They're in no hurry—but we are.

There's a general sort of drift, of course—but there isn't any way to hurry the blasted critters.

In vacuum tubes, electrons can be speeded up, and then allowed to drift on momentum; the klystron works on that principle, and allows us to generate 30,000 megacycle signals simply by letting the electrons "drift" along on momentum. But *this* "drift" is a matter of thousands of miles per second. It's not a drunkard's walk.

You can't make a transistor act like a klystron; the electrons aren't really in a vacuum; they're bumping along the pinball machine effect of germanium atoms.

For reasons of complex quantum mechanics, the bumping-along process in germanium is markedly faster than in silicon; hence the transistor manufacturers have concentrated more of their efforts on germanium transistors, although germanium is an extremely rare element—while silicon is approximately 50% of almost any hunk of rock you pick up.

It's that drunken-walk process in the base of the transistor that limits the frequency response of the device. The thinner the base can be made, the faster the transit will be. There are tricks that have been used to encourage the electrons to drift a bit faster, but the tricks are extremely complicated and unsatisfactory—and expensive.

In any case, experimenting with making transistors is something few hams are going to be able to do. It takes enormously elaborate and expensive equipment. We can experiment with their uses, but not with their structures.

The structure, however, imposes limitations other than the speed-of-response limitation. For many ham purposes, that speed-of-response is adequate anyway; the *Sylvania* 2N94A is perfectly good in the 75-meter band, for example, and is still functioning to some degree at 40 Meters. The inexpensive *GE* 2N107's are rated to a megacycle, but they'll oscillate at 3 Mc.

The transistor is also noisy. This leads to a curious phenomenon when it's used as an oscillator. Because the device depends on an *un*stable dielectric (a semi-conductor is necessarily a semi-insulator, and to be a transistor it must be an unstable semi-insulator!), the note produced by a transistor oscillator has built-in side-bands. Instead of making a clear, clean whistle in a receiver, it makes a whistle like a leaky steam valve. A *whissssh* instead of a *eeeeee* note.

For emergency use, this is not bad at all; it's a little fuzzy, but not enough to bother anyone copying CW. It might make SSB a little peculiar, however; you couldn't suppress the

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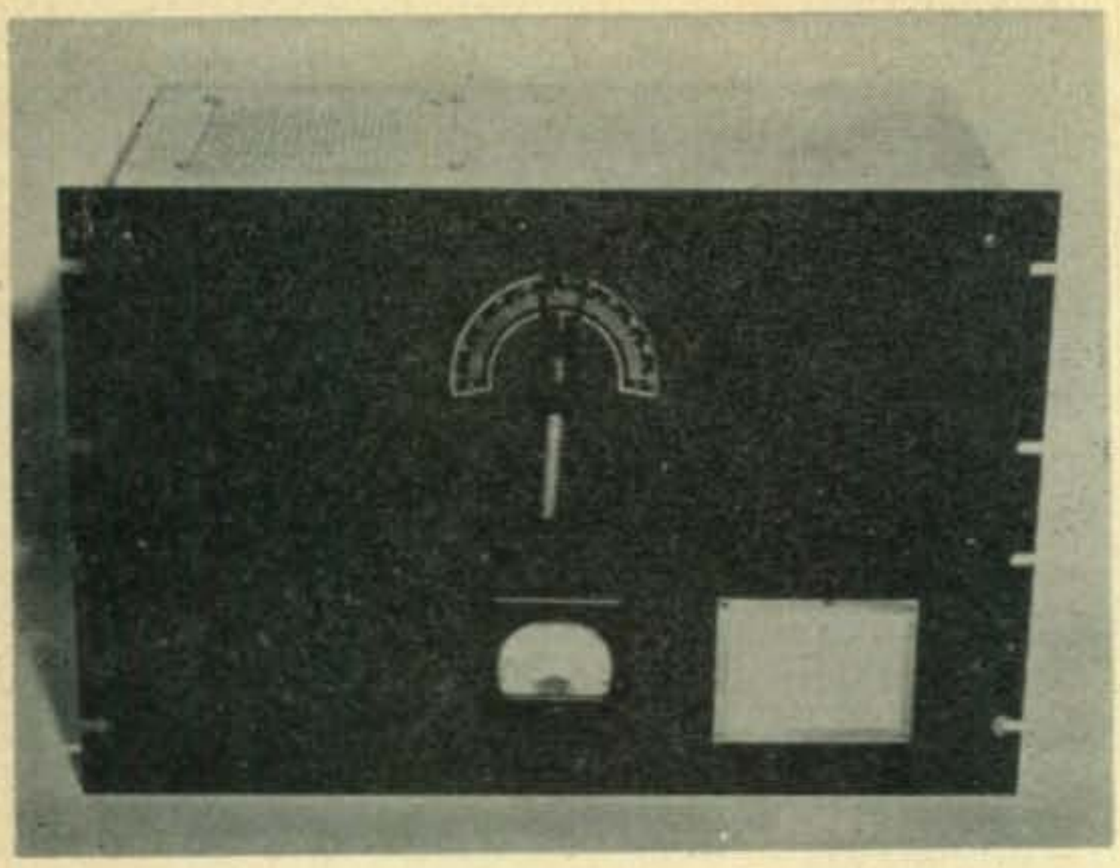
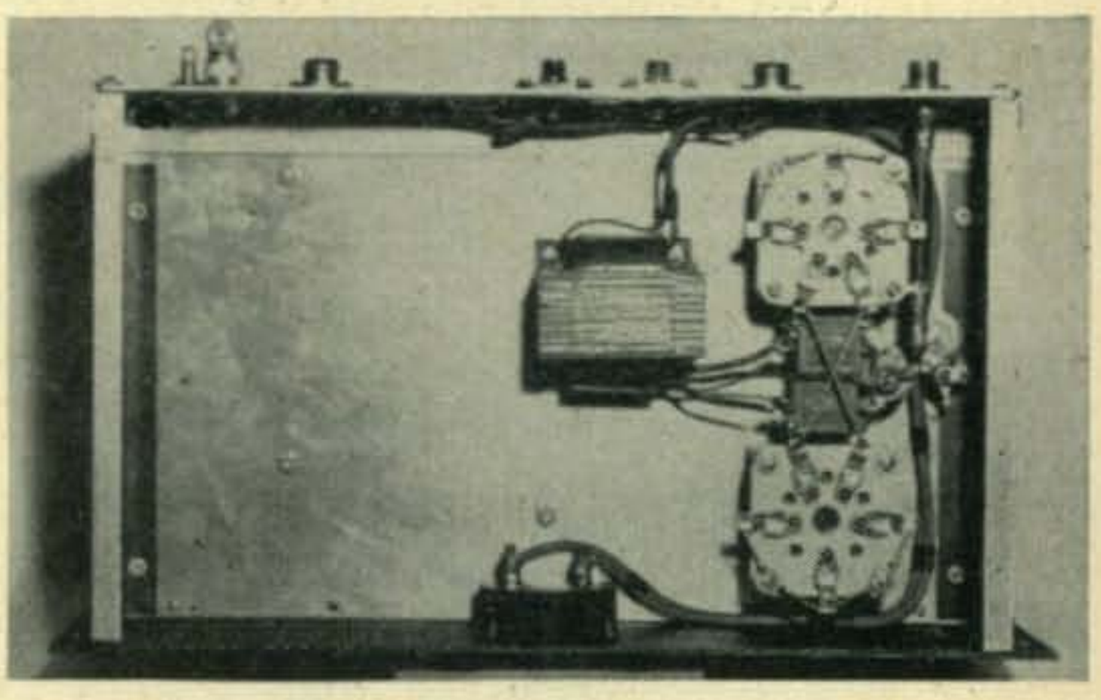


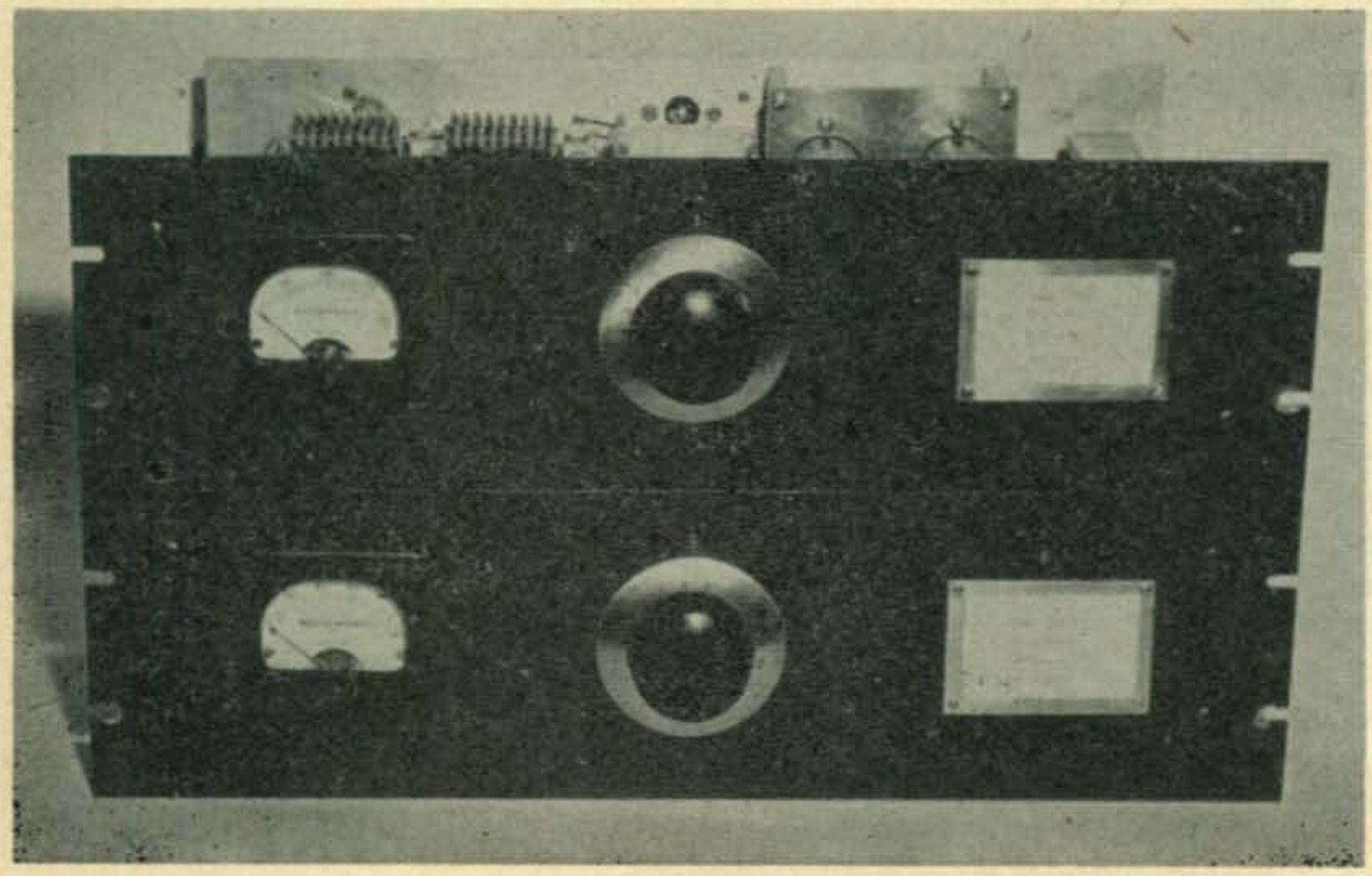
Neatness and simplicity typify the Ground Grid transmitter of Temple V. Ehmsen, W7VS, of Portland, Oregon. The single control tunes the plate tank of the pair of 803's Temp runs in the final. At 2,500 volts on their plates, the plate milliammeter shown spends most of its time at 400 mils on voice peaks. The familiar 19" standard relay rack construction has been used and this final sits in the rack above the two driver units pictured below. This final can be heard almost nightly around 3800 kcs on single sideband.

Bottom view of the W7VS grounded grid 803 final. Left to right upper is filament transformer and sockets with filament bypass condensers between the sockets. The RF choke between the filament center tap and ground serves as a tie point for the coaxial cable input to the stage. Filament transformer appears to be an open frame, non war surplus transformer.

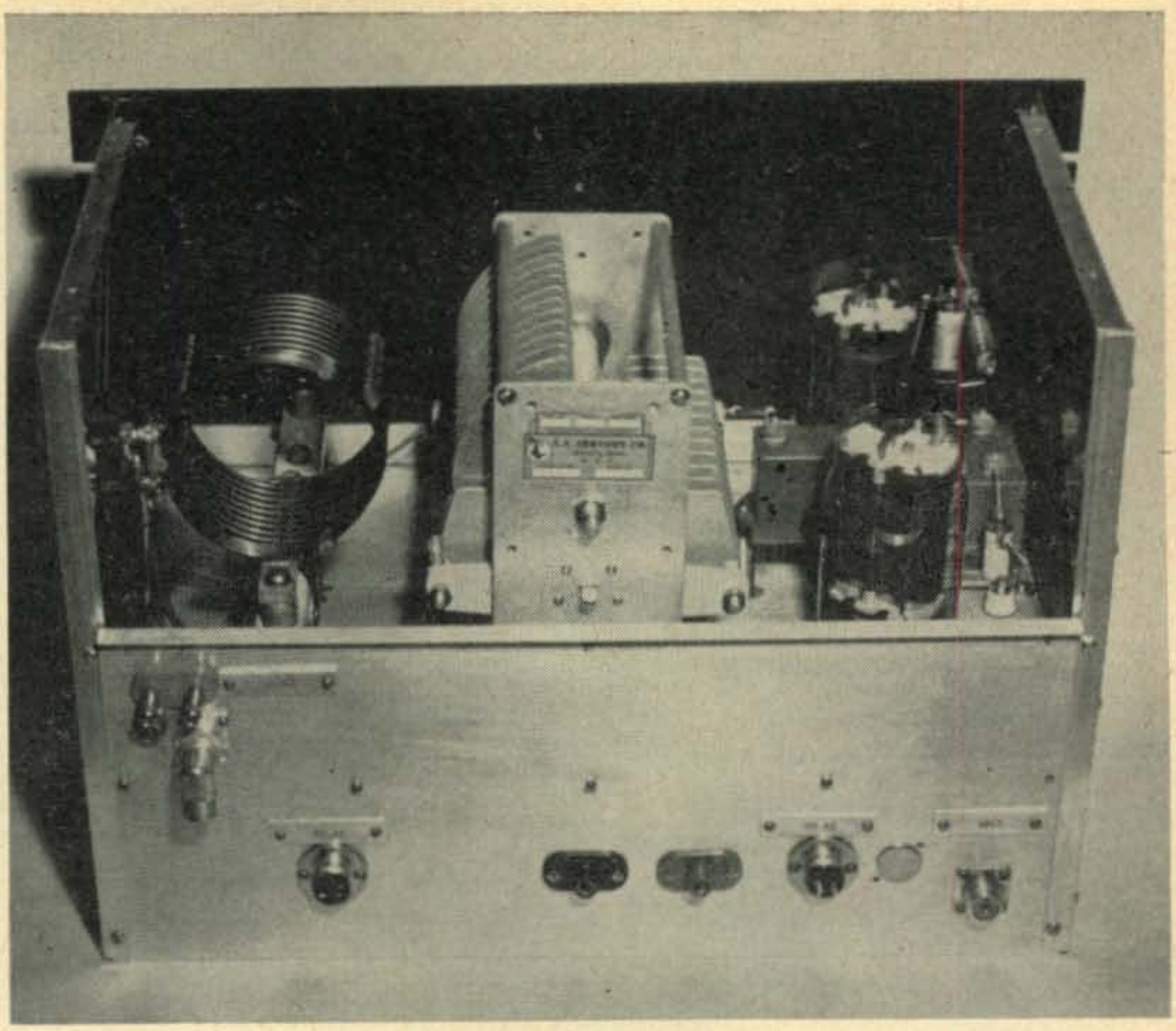


Grounded Grid In Full Dress

Norman R. Mc Laughlin - W6GEG
4143 Muirfield Road, Los Angeles 8, Calif.



W7VS carried the same neatness and simplicity into his 837 driver stages. The Top 19" rack contains the parallel 837 stage. These 837's operate at 1,200 volts and on voice peaks kick up to 160 mils. These two 837's are driven by a single 837 that also has 1,200 volts on its plate and is driven up to 40 mils on peaks by a Central Electronics 10A exciter.



The back of W7VS' 803 grounded grid final is as neat as the front panel. From left to right may be seen the tank coil with its swinging output link, the tank condenser is a Johnson 250C70, 252$\mu\mu$fd condenser with .175" spacing. Next is the plate blocking condenser, the two 803's and the top of an R175A rf choke. Two home built parasitic chokes connect the choke and 803's and the condenser below them is the by-pass condenser. The 2,500 volts d-c are brought to the choke via the feed through.

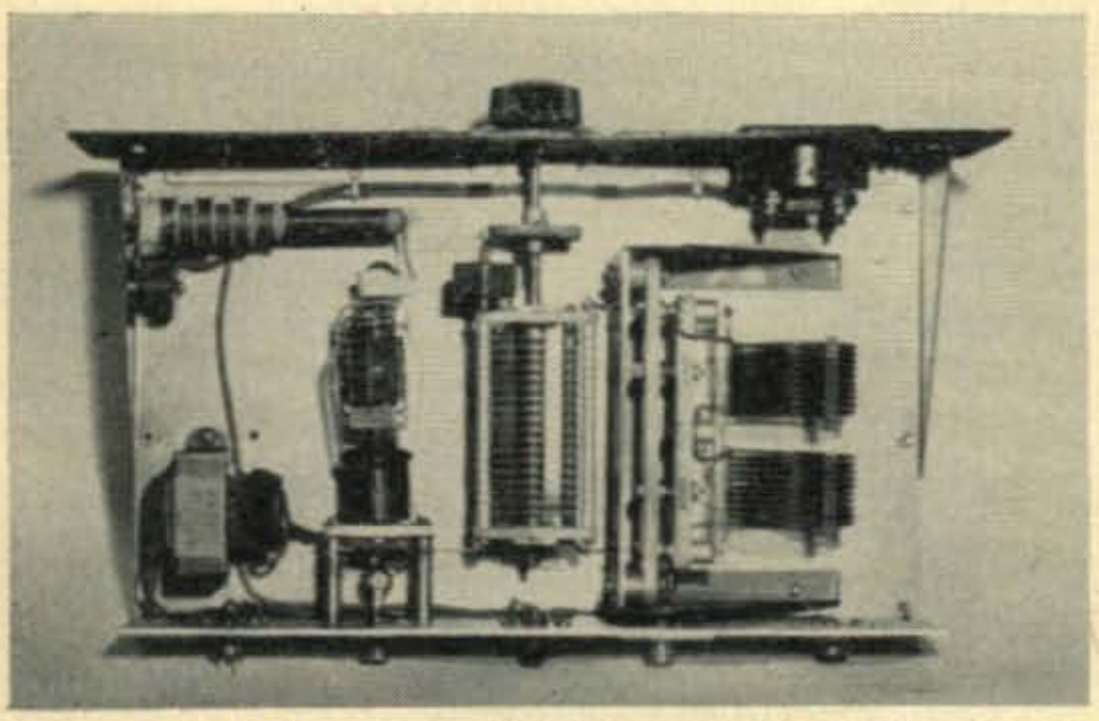
If proof were needed to the statement, 'One picture is worth a thousand words' it certainly lies in these photos of W7VS, Temple V. Ehmsen's 803 final and 837 drivers. So eloquent are the photos that little need be added other than how this lashup works.

In a recent letter, Temp wrote, "The last couple of days I've been on 75 with a 10A exciter plus your lineup[1] of GG 837's ending in a pair of GG 803's. Everything works just like you said it would, with excellent quality reports. I have even checked the 837's with as high as 2,000 volts (no modulation) and the static current remained low with no sign of breakdown."

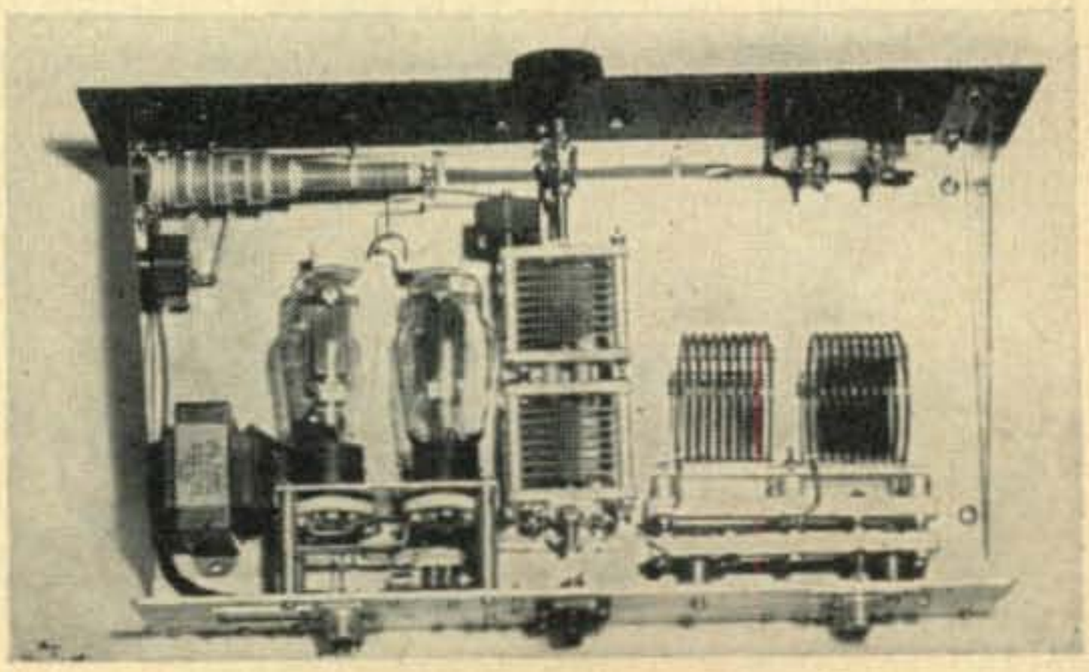
"All condensers tune about the center of the 3.8 to 4 MC spread and everything performs the way you said it would. The first driver kicks up to 40 mils. at 1200 volts and with a 10A exciter. The parallel 837 driver kicks up to 160 mils. at 1200 volts and the final kicks to 400 mils. at 2500 volts."

Temp, who lives in Portland, Oregon, is Chief of Bureau of the Bureau of Communications and Electronics for the City of Portland. It should go without saying that communications and electronics in Portland must be in pretty fine shape. ■

References: 1 Norman R. Mc Laughlin, QRO[10] or Something for Nothing, Almost, CQ, Feb. 1956



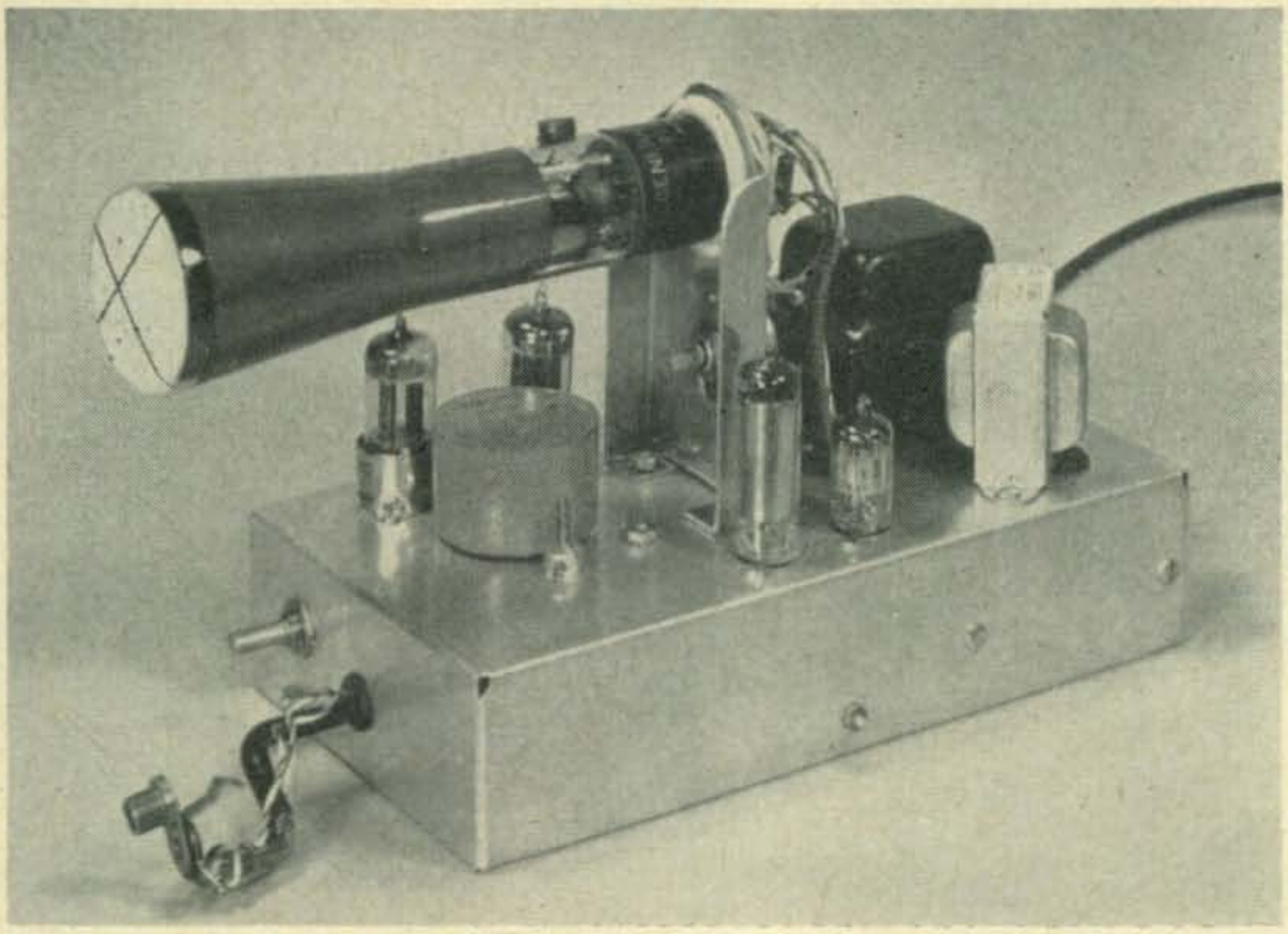
Top view of the first 837 driver stage follows familiar pattern for neat layout and short leads. Note that plate tank coil has been oriented 90° from the plane of the following 837's stage. In lower right hand corner, also note that output tap is only about a turn and an eighth up from ground end of coil.



Top view of the W7VS parallel 837 driver stage. The split stator tank condenser has both sections tied in parallel. Note in lower right hand corner of coil jack bar where tap on tank coil is taken at about the third turn from the bottom.

even if you're not on RTTY, you'll find this a fascinating device . . .

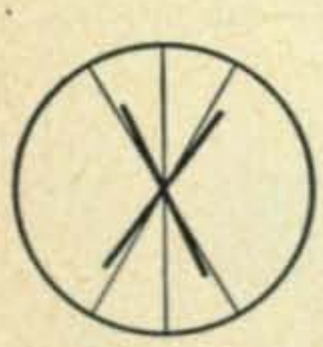
Bruce Meyer, WØHZR



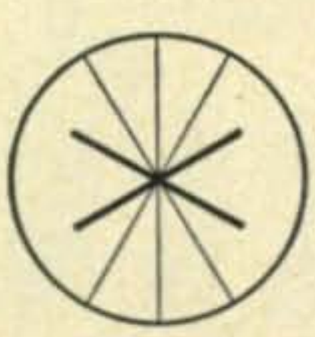
FSK Tuning Indicator

The problems of RTTY enthusiasts working the "d-c" bands, (80, 40, & 20 Meters) with frequency-shift keying are significantly different from those of amateurs using VHF nets and AFSK. Among the difficulties encountered are the recognition of the amount of frequency shift in use by each communicating station and the tuning of the incoming signal with respect to the filters of the receiving converter. Unless the operator is gifted with ears capable of recognizing absolute pitch in the 2000 to 3000 cps frequency range, it is generally necessary for him to devote 30 seconds or more to the "acquisition" of an RTTY signal by tuning his receiver for intelligible printer copy. With weak signals a nearly perfect adjustment of signal frequencies is required to take advantage of filter band-pass optimum characteristics. In roundtable operation, therefore, much time must ordinarily be spent by each participant in sending RY's or other meaningless signals for another individual to tune up.

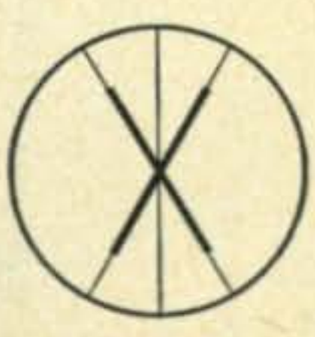
The indicator described will permit two-second "acquisition" of an incoming signal, and provide a visual display of frequency-shift, signal strength, and selective fading of the signal tones. The display is compass-like, with a straight line trace which rotates about the center point of the cathode-ray tube screen as the frequency of the incoming tone is changed. The device is a special type of oscilloscope, inexpensively constructed for the specialized application of RTTY signal monitoring. Of course, a conventional 'scope could be used



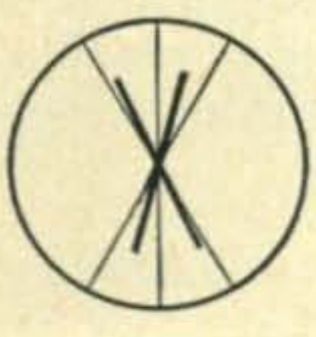
SHIFT OK, TUNING HIGH



SHIFT EXCESSIVE, TUNING LOW



SHIFT OK, TUNING OK



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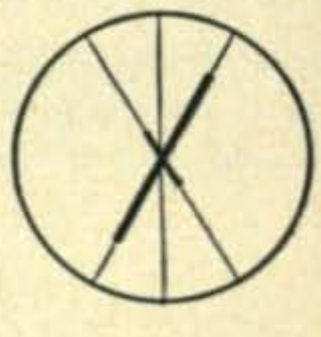


SHIFT OK, TUNING OK (SELECTIVE FADING OR UNBALANCED RESPONSE)

for this purpose, but there is danger in such use that the calibration will be lost if the gain controls are not locked in place.

New Shift Regulations

The following information relates principally to the mark/space frequencies of 2125 cps and 2975 cps. These represent the 850 cycle shift and reference frequencies accepted by most amateur teleprinter enthusiasts as unofficial standards needed for intercommunication on both the high-frequency and VHF bands when using the same type of receiving converter for both FSK and AFSK reception. These frequencies have merit for two reasons: First, they are the fifth and seventh harmonics, respectively, of 425 cps, making calibration easy. Second, they define a pass-band of frequencies within which no two frequencies are harmonically related. This reduces the filter and distortion problems.

With the newly authorized relaxation of the FCC frequency-shift regulations, many amateurs will experiment with narrow shifts. All amateurs interested in teleprinter communications will desire equipment with which they may monitor all shift values from zero to the legal maximum of 900 cps. For this reason a technique for adapting this monitor unit to various frequencies and shifts is also included in this article.

Pattern

To reduce the number of circuit components required in the 'scope, the CRT display chosen was one of amplitude and frequency, derived from phase shift in a series-resonant circuit tuned to the center of the desired audio signal pass band (*Fig. 1*). In nearly all amateur RTTY converters the frequencies of primary interest are 2125, 2550, and 2975 cps. If the resonant circuit used for phase reference is tuned to 2550 cps, then 2975 cps, a frequency above resonance, will provide a phase shift in the opposite direction from that occurring with 2125 cps, a frequency below resonance.

Those familiar with phase comparison methods using a CRT will recall that in-phase voltages applied simultaneously to the horizontal and vertical deflection plates of a CRT will produce the slant-line pattern illustrated in *Fig. 2*. When the voltages are phased 180 degrees, the pattern of *Fig. 3* results. With the 90-degree phase difference which appears at exact resonance between the tone source terminals and the LC junction point of a series resonant circuit, an elliptical pattern is ordinarily produced on a CRT (*Fig. 4*). This pattern can be a smooth ellipse only if the tone source has no harmonic content or distortion. A strong second harmonic component in the signal may produce a figure-8 pattern (*Fig. 5*). For this reason it is important that the device be connected ahead of any audio distorters, such as limiters.

Phase and Q's

If the phase display were to be used as described above, it would be necessary for the operator to recognize the 2550 cps center frequency as an elliptical pattern whose major

Front view of the FSK "Eye"

axis is vertical. As the incoming signal is tuned above or below resonance the ellipse must tilt and then degenerate into the straight lines shown in *Figs. 2 & 3*. The extent to which the ellipse collapses, for a given change of frequency, will depend largely upon the Q of the inductor used in the series resonant circuit. The higher the Q, the more quickly the off-resonance pattern will approach the appearance of a straight line. Relative rates of change of phase for coils of various Q values are il-

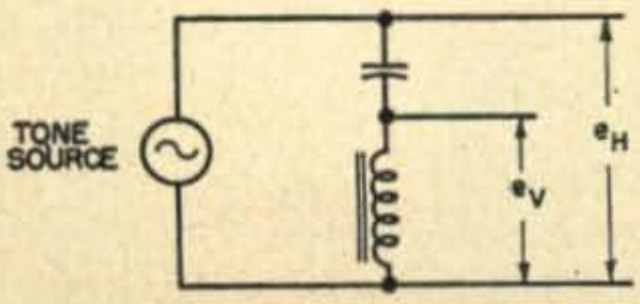


Fig. 1. Phase-shift circuit

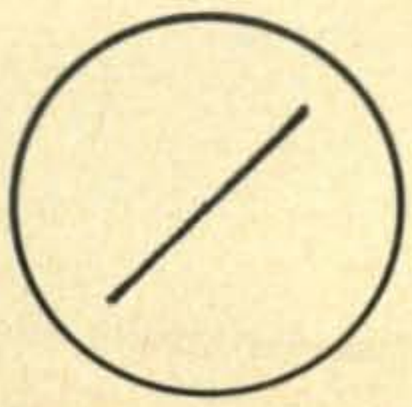


Fig. 2

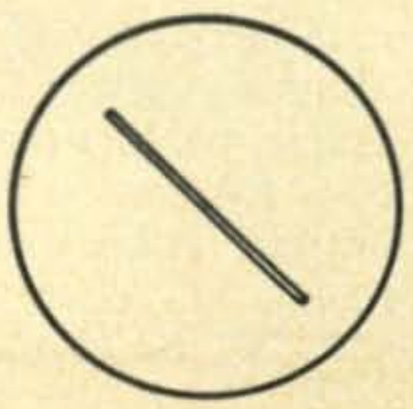


Fig. 3

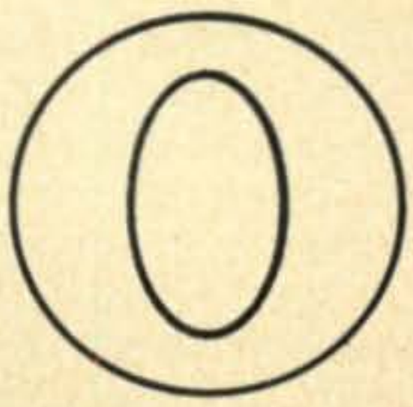


Fig. 4

lustrated in *Fig. 6*.

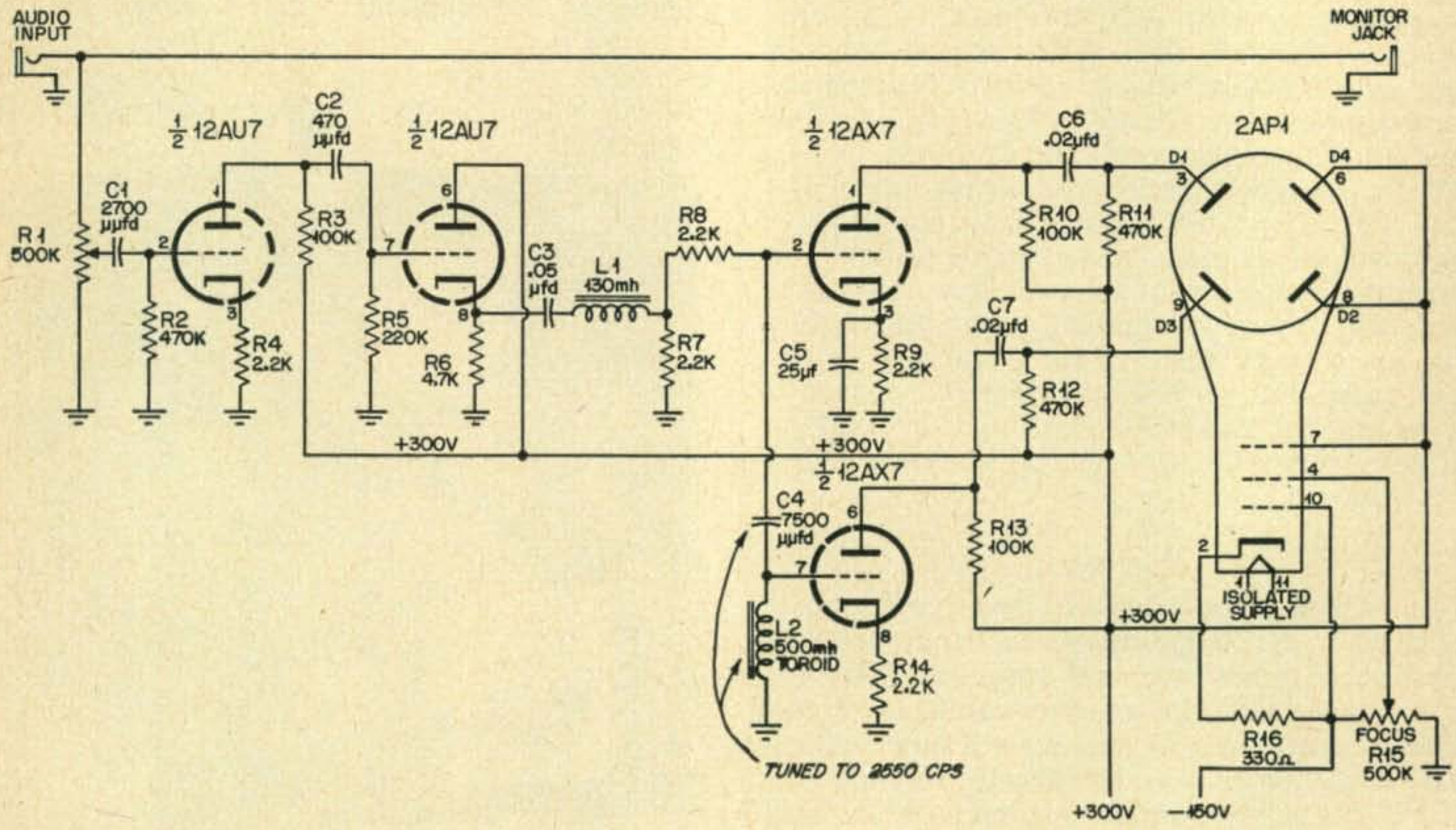
Fortunately, a simple modification of the circuit of *Fig. 1* permits the trace to remain very nearly a straight line for any single tone frequency within the pass-band of the resonant circuit. The purpose of this recommended modification, shown in *Fig. 7* and in the equipment schematic, is to simplify the CRT display and thereby make it easier for the operator to accurately determine or set the frequencies of the RTTY signal tones. With this modification, the series LC combination at resonance approaches the status of a short circuit (the principle is that of the venerable shunting wavetrap). This means that the resultant voltage e_H across both L and C in series is very nearly zero although an appreciable voltage e_V still exists across L and C individually.

The effect is to reduce the width dimension of the displayed phase ellipse at the same rate as the phase changes, in order that the ellipse will remain very narrow. With this modification it is possible to use the angle of the CRT display as a direct indication of frequency. A vertical line is one having no horizontal axis voltage component and, therefore, indicates the center (series-resonant) frequency of 2550 cps.

Component Values

Component values other than those indicated in the schematic diagram may be used if not so radically different that circuit performance is impaired. If, for example, a toroidal coil and resonating capacitor other than those specified are used, it may be necessary to select a different value of series resistor *R8* to permit the length of the trace at 2550 cps to be about the same as at 2125 and 2975 cps. This resistor, in series with this particular capacitor and inductor, causes the CRT trace length at resonance to be no greater than that above or below resonance. If the resistor were too small, the mid-frequency trace would be quite long.

One characteristic inherent in this type of circuit will affect the angular linearity of the CRT display and the lengths of the traces for various frequencies. It is the rising voltage response of the inductor with frequency. This means that the angular difference between traces at 2125 cps and 2550 cps will not be exactly the same as that between 2550 cps and 2975 cps. The difference is small enough so



Parts List for FSK Tuning Indicator

R1, R15 500K potentiometer
R2, R11, R12 470 K
R3, R10, R13 100K
R4, R7, R8, R9, R14 2.2K
R5 220 K
R6 4.7K
R16 330 ohms
C1 .0027 µfd
C2 470 µµfd
C3 .05 µfd
C4 .0075 µfd
C5 25 µfd 25v
C6, C7 .02 µfd
L1 130 mh Grayburne V60 ferrite coil, adjustable (TV type)
L2 500 mh toroid

that it is no handicap in making frequency shift measurements.

Although it is not absolutely essential in this circuit, an inexpensive audio equalizer consisting of C3 and L1 is included ahead of the 2550 cps series resonant circuit to compensate for the difference between trace lengths at 2125 cps and 2975 cps. The equalizer has a low Q and is resonated near 2200 cps for a slight peaking effect in that region.

Construction

No particular care is required in building this unit since the layout is relatively noncritical. One precaution which must be ob-

served, however, is to avoid placing the cathode ray tube in a strong a-c magnetic field, since this will modulate the deflection of the trace. In the author's unit the power transformers were placed behind the socket of the CRT, and an aluminum chassis was used. No hum was observed in the display. Centering controls may be dispensed with if a tiny *alnico* magnet is cemented to the neck of the CR tube where it will cause the electron beam to center at the face of the tube.

The use of bypass capacitors, except as shown, should be avoided since they tend to increase phase shift and non-linear amplification by the tubes.

Calibration

The use of an accurately calibrated audio oscillator is mandatory if the standard tones of 2125, 2550, and 2975 cps are to be displayed. Any oscillator of good stability can be calibrated to the necessary accuracy by referring it to harmonics of the 600 cps and 440 cps tones transmitted by WWV and WWVH. These may nearly always be heard on 2.5, 5, or 10 Mc. For such comparison, another 'scope may be used for a *Lissajous* display, or the amplifiers and CRT of the constructed monitor 'scope may be employed for this purpose.

When the builder is satisfied with the oscillator's calibration, he may apply its output at 2550 cps to the input of the monitor unit and then adjust the gain, focus, and CR tube rotation for a narrow vertical line not longer than the 'scope tube face diameter. This display position may conveniently be marked by stretching a dark thread across the face of the CRT and cementing its ends to opposite sides of the tube. Two more "hairlines" should be added at the trace positions corresponding to frequencies of 2125 cps and 2975 cps. All three threads then should cross at the center of the tube face (*Fig. 8*).

Modifications

The 'scope unit described above may be used with any convenient narrow range of frequencies[1] simply by using a different L2 and C4 tuned to the center of the desired range, and by selecting a new value for the series resistor to equalize the trace lengths at various frequencies in this range. (The equalizer L1/C3 may be omitted if the shift is very small compared to the center frequency

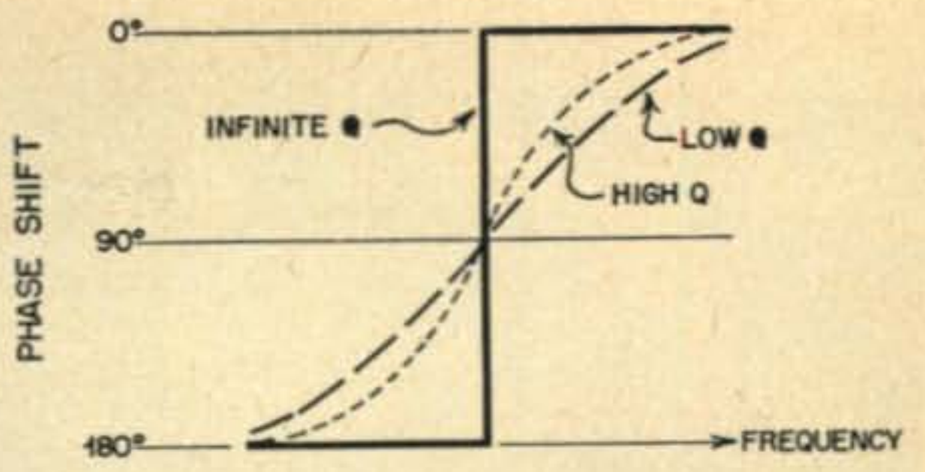


Fig. 6. Sharpness of shift vs. Q

chosen.) Also, the angle displayed between the mark/space traces for a given frequency shift is a function of the ratio of the horizontal amplifier gain to that of the vertical amplifier, regardless of the 'scope unit used for this application. By making the horizontal amplification large, it is possible to display a very small frequency shift as two lines with a large angle between them.

Operation

With no input signal, the CRT display will be a spot at the center of the screen. A blemish or burn can occur here if the spot is not deflected, but this will not affect the utility of the unit.

When a signal whose frequencies lie within the pass band is applied, a pattern of bright

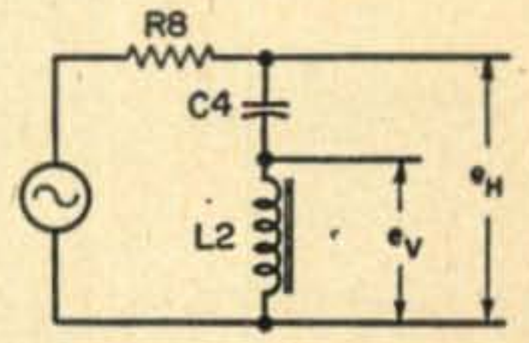


Fig. 7. Circuit to simplify CRT display

straight lines should appear on the 'scope. If two-frequency FSK is being observed, an X will appear on the indicator tube face. The angle between the legs of the X may be compared to the angle between the "hairlines" to determine frequency shift. By aligning the displayed X parallel with the "hairlines" the frequency shift may easily be estimated and adjusted to within 10 cps of the calibrated values (my five-year-old son can do it in a few seconds).

Drift of average frequency with constant shift appears as an overall tilt of the displayed X with respect to the "hairlines." A tilt clockwise will indicate too high a tone pair; a tilt

[*Continued on page 120*]

1. Boyd Phelps, WØBP, RTTY, Jan. 1956, pp7-8

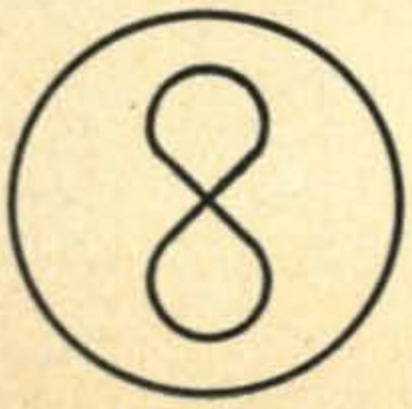


Fig. 5. Lissajous display

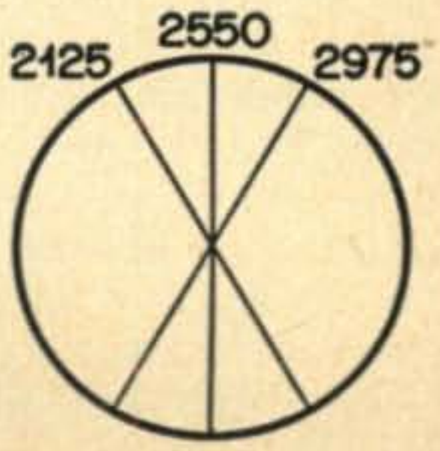
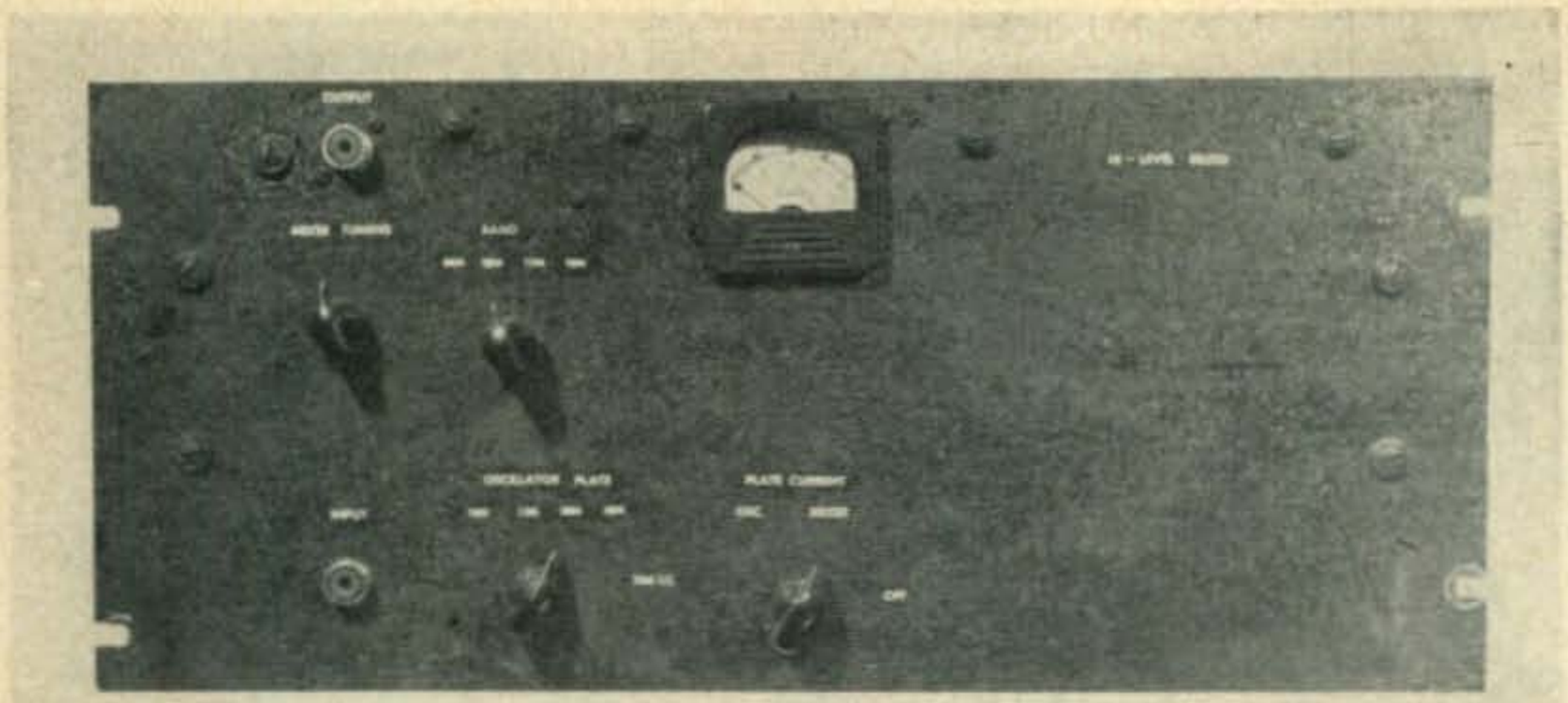


Fig. 8. CRT tube face markings



Front panel view of the W3NFT Hi-Level Mixer. With a 75-meter input signal it will heterodyne to 40, 20, 15 and 10, with sideband switching on 20 Meters.

Allan W. Porsch, W3NFT
West Main St., Brookville, Pa.

band-switching

Hi-Level Mixer

All-band SSB is still a dream, it seems. Even the most affluent-sounding KW's you talk with on SSB do not boast of SSB on, say, 10 thru 80. Why? Frequency-multiplication just won't work with SSB. Heterodyning must be used, and the information-packed sideband must not be mangled anywhere along the line by non-linear amplification.

Except on 20, SSB on any band above 75 is still quite a rarity. No one seems to have come up with a simple frequency converter for commonly-used SSB rigs. A little black box you can plug the output of your 75-meter SSB exciter into, that will give you medium-power SSB on all the popular phone bands. And that is what this little black box does.

Design

The design illustrated uses two tubes and is completely bandswitching. It will convert a 75-meter sideband signal to 40, 20, 15 or 10 Meters. The 11-meter band may also be covered as will be described later. In this particular design four crystal frequencies were selected, below the band of output, and one crystal above the band of output was chosen. In the first case, the *sum* of the heterodyning frequencies, crystal plus exciter output, was selected for the output frequency (when the *sum* of two frequencies is selected, the original sideband component will appear in the output). In the latter case, with the crystal above the band desired, using the *difference* between the oscillator frequency and exciter output, reversal of the original sideband is accomplished.

Since the author's filter-type exciter has an integral v.f.o. covering the frequency from 3.8 to 4.0 megacycles (lower sideband), the following table shows the crystal and output frequencies available.

TABLE I

Crystal Mc		Exciter Output Mc		Output Mc	Sideband
3.300	plus	3.8-4.0	equal	7.1 - 7.3	lower
10.300	"	"	"	14.1 -14.3	"
17.455	"	"	"	21.255-21.455	"
25.225	"	"	"	29.025-29.225	"
18.100	minus	"	"	14.300-14.100	upper

The first four output frequencies above represent the original sideband transmitted. The last output frequency reverses the original sideband.

This is an advantage on Twenty Meters when the original exciter output is on the lower sideband, as most 20-meter operation is confined to upper-sideband. An additional feature in be-

ing able to switch sidebands is the ability to "hug" the phone band edges with the wanted sideband within the authorized phone frequencies, provided the unwanted sideband is sufficiently attenuated so as not to violate Section 12.113 of Part 12 FCC Rules Governing Amateur Radio Service.

The circuit diagram is shown in *Figure 1*. A 7C5 Lock-in tube is used in a conventional tetrode oscillator circuit. Similarly, the octal equivalent 6V6 may be used, but since its interelectrode capacities are slightly different, difficulty may be experienced in getting the higher-frequency crystals to oscillate with the circuit components listed. This will be particularly true with the 25-Mc. crystal.

The crystal selecting switch *SA1-2* is a 2-gang, 2-pole, 11-position switch which selects the proper crystal frequency and oscillator output tank circuit. The oscillator coils *L1-L5* are *Cambridge Thermionic Corporation* slug-tuned coils, as is also *L6*, the input coil to the mixer. In parallel with *L1*, the 40-meter coil, are two small padder condensers, one of which is variable. The latter feature is not necessary, and a single ceramic or mica condenser of 40 $\mu\mu$fd may be substituted if so desired.

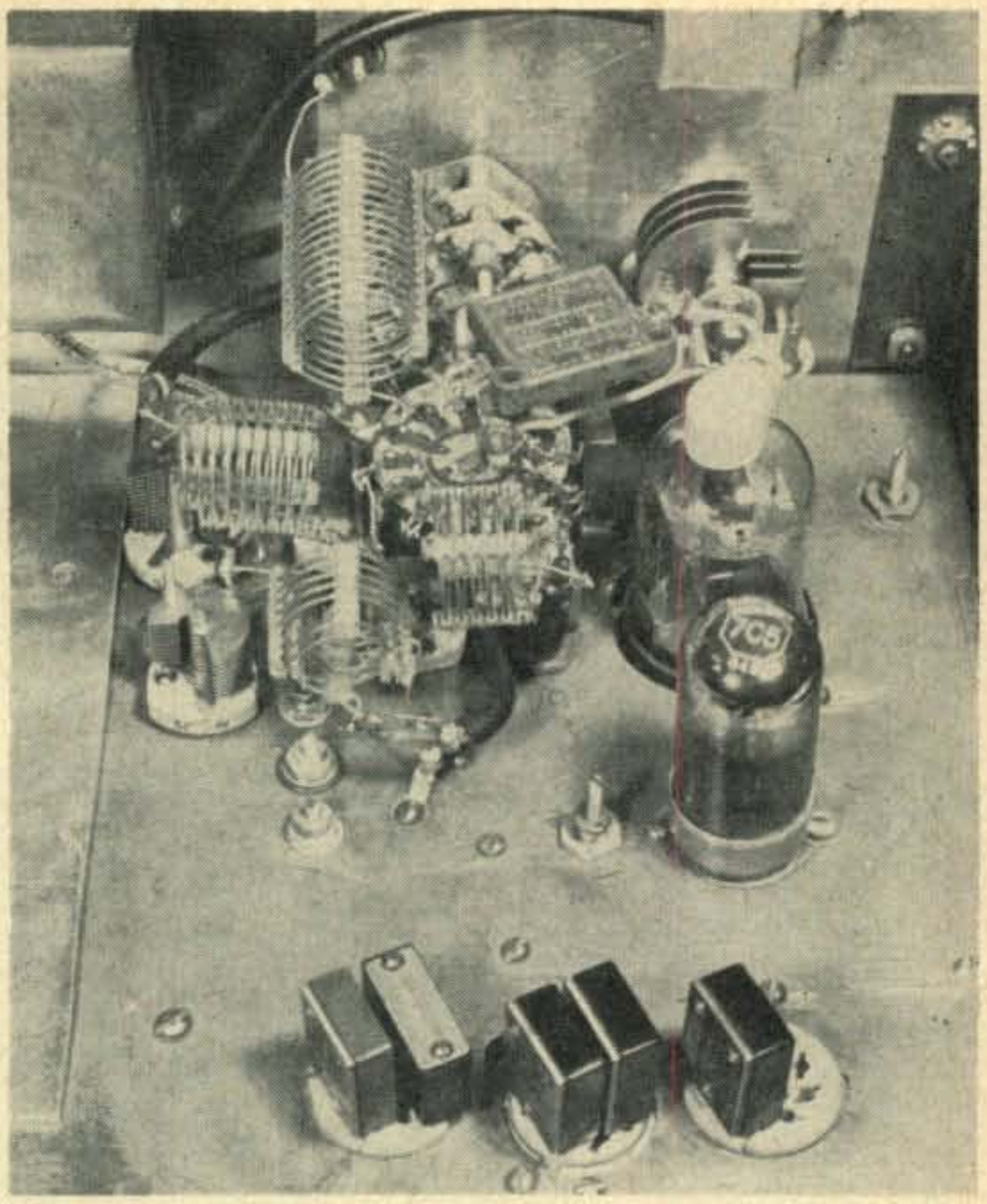
Crystals

Although no difficulty was experienced with the crystals at the higher frequencies, some trouble could be encountered with weak or poor-grade crystals. It is suggested that active crystals from a reputable manufacturer be used, particularly those above ten megacycles. The crystals used were a *Bliley AX-3* (25.225 Mc.), *Peterson Radio* type *2XP* (18.100 Mc., 17.455 Mc. and 10.300 Mc.) and *James Knight H-73* (3.300 Mc.). Another precaution is to keep the crystal leads as short as possible.

Output of the oscillator is fed through a 3-30 $\mu\mu$fd trimmer condenser to the grid of the 807W mixer stage. In the original design a fixed condenser of 40 $\mu\mu$fd capacity was used and the writer spent many a sleepless night getting the oscillator stage to oscillate easily on 25 Mc. It was finally reasoned that the high value of fixed condenser loaded the 7C5 stage too much, preventing it from oscillating. With the variable feature of *C5*, it can be set to its optimum capacity on the initial adjustment, as will be described later.

The mixer stage uses the popular 807W or 807. Many of the surplus 807's were tried and they all worked equally well. The oscillator is connected to the control grid because, as explained by Jack N. Brown[1], the mixing oscillating voltage should be several times greater than the SSB signal, in order that the output signal be a true replica of the input SSB signal.

The incoming SSB signal is link-coupled to the slug-tuned coil *L6* in parallel with condenser *C8*. The variability of *C8* and *L6* permits it to be easily tuned to the selected frequency, which is set at 3,950 kc. Other frequencies may be peaked if it is desired to operate at maximum efficiency. In most cases only a few watts input will permit the mixer to operate at its maximum efficiency, over its entire range, without retuning *C8* or *L6*. Therefore *C8* was not made a panel control.



Close-up view of mixer plate circuit. Visible but partly covered is the modified switch SB. Counter-clockwise, starting with the top center coil, are the 40, 20, 15 and 10 meter coils, respective padder condensers below or just to left side of coils. Main tuning condenser C10 is mounted on the right front panel. High-voltage condenser to left of 807W plate cap is C11.

Bias

The 807W mixer is operated with a minimum fixed bias of –45 volts, which may be supplied by a small battery. Since less than 1 ma. grid current flows, the battery can be expected to last practically its shelf life. The mixer will work with cathode bias with a cathode resistor suitably by-passed for r-f; however, by using fixed grid bias, the conversion gain of the mixer is optimum, therefore greater power-output is available.

Note the 10,000 ohm resistor *R5* across the 2.5 mh choke *RFC1* in the grid circuit. It was found by experimentation that this value of resistance produced nearly ten percent more output. The resistance is fairly critical and should not deviate more than plus or minus ten per cent from the value listed.

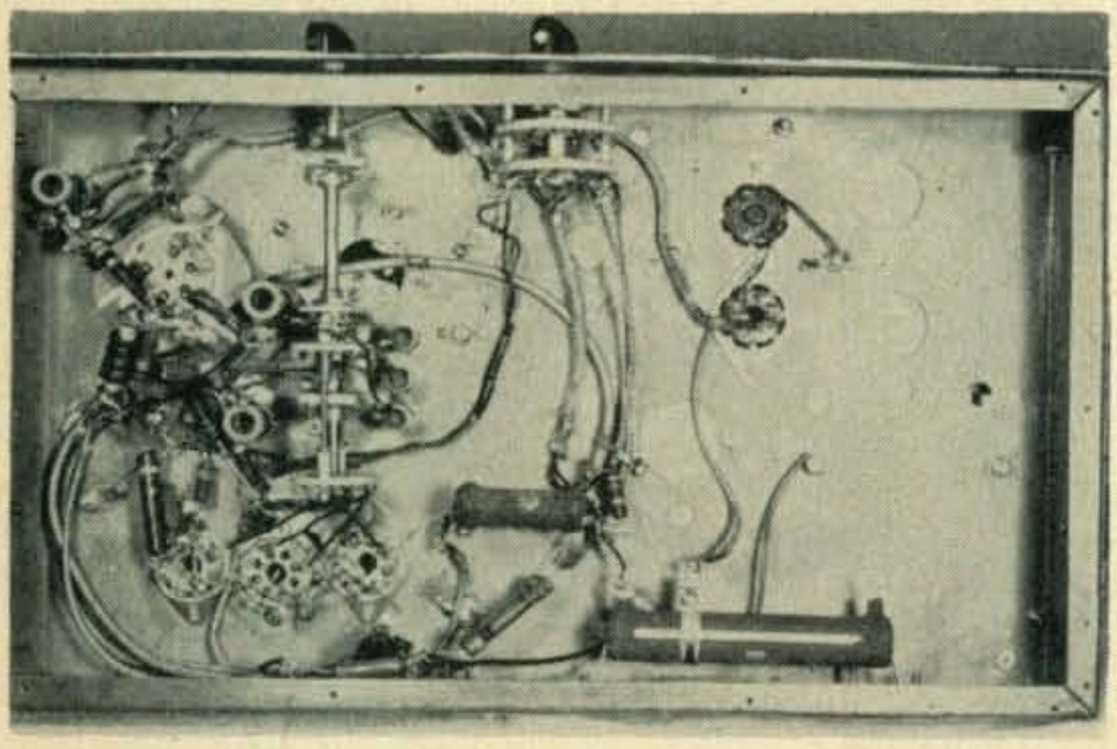
R6 and *R7* are parasitic resistors in the grid and screen circuits. They effectively prevent

any instability of the mixer stage, either of a fundamental or parasitic nature.

Q

The output circuit of the mixer was designed around good engineering practices in that the loaded *Q* of the circuit approximates 12. No attempt will be made to go through the design procedure of the plate tank circuit as this has been covered many times in various publications, including *CQ's Single Sideband Techniques Manual.*

Of interest in the mixer tank design is a small *Hammarlund type Mc-20-S* variable



Beneath the chassis are: Oscillator, center; oscillator plate coils, grouped around the front wafer; crystal sockets, behind the rear wafer; 4-Mc input coil, extreme front left; sub-mounted 807W socket, to right; behind this, the 7C5 Lock-in socket. At front right is the meter switch. Mounted on the right rear wall is limiting resistor R9.

capacitor (*C10*) used for resonant tuning. Across each of the tank coils are separate *Hammarlund APC*-type air padders. This arrangement limits the tuning range such that it is impossible to tune the plate circuit to the incorrect frequency, on any of the bands, while maintaining the proper circuit *Q*.

During the mixing process, various frequencies are generated and available. There are fundamentals, sum and difference frequencies, and harmonics thereof, and it is all too easy to tune up on the incorrect frequency. For instance, with 40-meter operation, a 4.0 Mc SSB signal beating with a fixed 3.3 Mc signal will produce three output frequencies relatively nearby, namely, the sum of the two, 7.3 Mc, and their harmonics, 8.0 Mc and 6.6 Mc. Try selecting the wanted frequency with a conventional 100-200 $\mu\mu$fd condenser, without mishap!

VR

The screen grid of the 807W is voltage regulated with a pair of OD3/VR150 in series, since the screen current may vary up to 3 ma. during maximum signal drive. A pair of OC3/VR105 or a single OD3/VR150 may be used with equal success, with a slight reduction in output.

The 7C5 oscillator screen is regulated through a 56K resistor. By maintaining constant screen voltage, even though the supply voltage may vary, even the slightest frequency shift in the output of the oscillator is prevented.

Output of the mixer is fed thru 73-ohm coax (*RG 59/U*) to a low-pass filter identical to that described in the 1953 *Handbook*[2]. It used ordinary silver mica condensers and is easy to construct and align. Its use is recommended to suppress any v-h-f harmonics that could cause TVI.

Conventional r-f by-passing and filtering techniques are used for leads that run external to the mixer, and power leads are shielded.

A 100-ma. meter is used to indicate oscillator and mixer plate current. This is convenient for initial alignment, although not absolutely necessary. Its principal advantage after the initial tune-up lies in metering the mixer stage during carrier injection periods to prevent driving it beyond its maximum plate dissipation rating, which could result in tube damage. The convenience of visually monitoring the oscillator stage functioning cannot be overlooked either.

Mechanical Details

The Hi-Level Mixer was built on a steel 17″ x 10″ x 3″ chassis, which once housed the speech amplifier and modulators of an a-m

TABLE II

E_{plate} = 550v, $E_{screen2}$ = 300v, Oscillation adjusted for 50 ma. I_{plate} drive.

	E_{grid1} = –45v	E_{grid1} = –60v	E_{grid1} = –80v	E_{grid1} = –90v
807				
I_{plate} (Osc. on only)	50 ma.	50	50	50
I_{plate} (Osc. plus SSB drive)	73 ma.	77	70	68
I_{grid2} (Osc. on only)	2.6 ma.	2.6	2.4	2.2
I_{grid2} (Osc. plus SSB)	4.8 ma.	5.1	4.9	5.0
I_{grid1} (Osc. on only)	0	0	0	.15
I_{grid1} (Osc. plus SSB)	.45 ma.	.7	.35	.90
Scope 2-tone Output (arbitrary)	14 div.	18¼	19	19¼

rig. The aluminum panel is 8½ inches high and was finished in black wrinkle varnish. The size of the chassis and panel could be reduced considerably in proportion without adversely affecting operation of the mixer. Parts layout is not too critical, except for the higher frequency crystals. It is suggested that the crystals above 20 Mc be grouped closest to switch *SA2* for minimum lead length.

As can be seen in the full-chassis photograph, the mixer plate tank coils are grouped about switch *SB*, with the air padder condensers close to them. The crystals are mounted in octal ceramic sockets to the rear of the chassis. To the far left is the low-pass filter, and adjacent are the voltage regulator tubes. In the panel center is the 100-ma. meter, completely shielded.

The front photograph shows the following: Top left, a type *83-1R* coax output receptacle; just below, the mixer plate tuning condenser; to the right, the mixer band switch *SB*. The 4-Mc input connector is shown on the bottom left; adjacent and to the right is the integral oscillator plate and crystal switch *SA*. To the right of it is the meter switch.

The under-chassis view shows the 4-Mc input coil, *L6*, at the top left. Grouped about the front wafer switch *SA2* are the oscillator plate coils; 25-Mc *L4*, 18-Mc *L5* and 17-Mc *L3* are to the right, and 10.3-Mc *L2* and 3.3-Mc *L1* are to the left. The cold end of these coils are all tied together and by-pass condenser *C4* is soldered directly between the cold end of *L1* and the nearest ground point.

The 807W socket is sub-mounted 1⅜ inches below the chassis for better shielding purposes and to permit the use of shorter lead lengths.

Band Switches

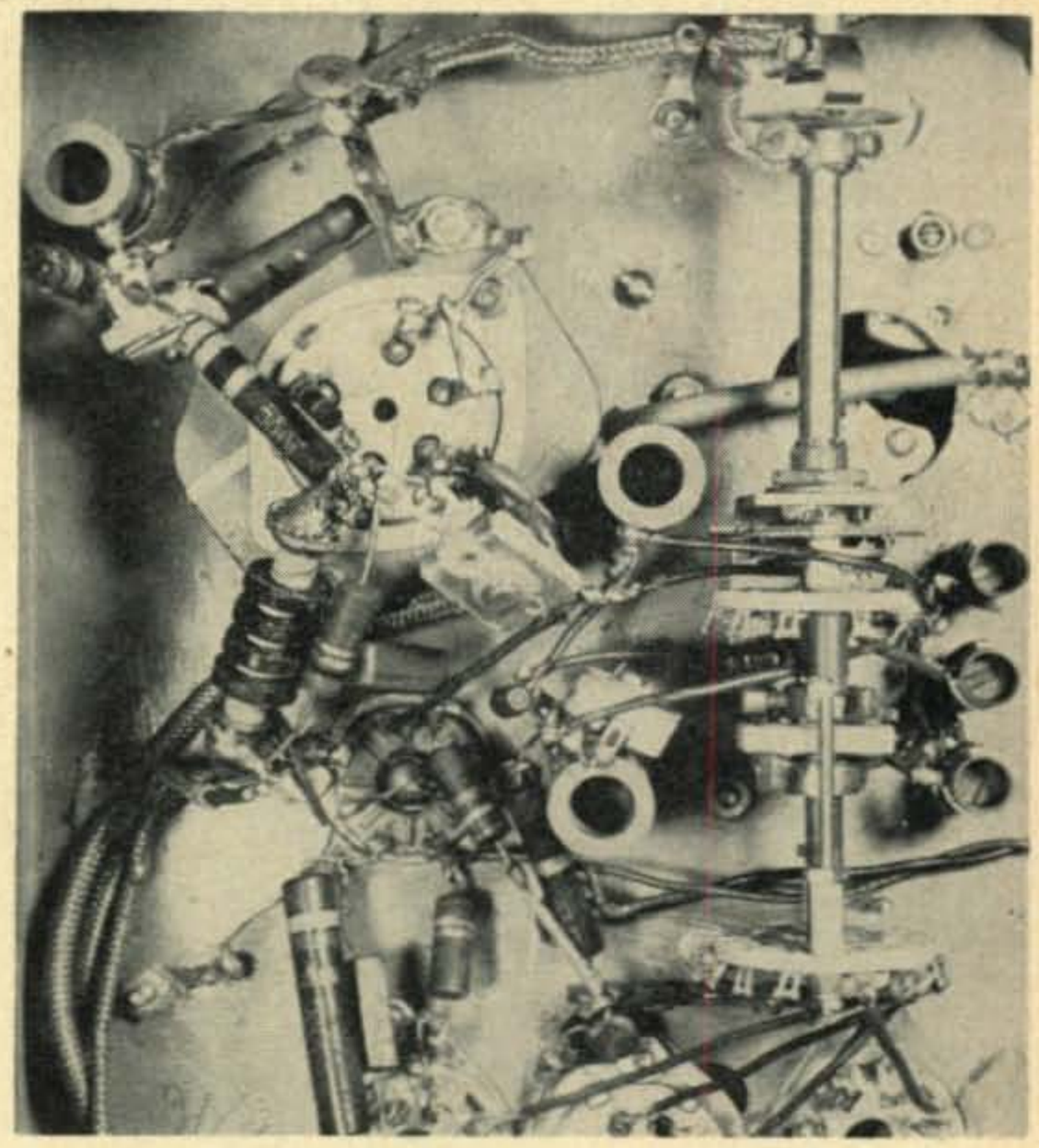
Oscillator switch *SA1-2* is a *Centralab Miniature Steatite* 2-gang, 2-pole, 11-position switch modified as can be seen in the under-chassis photo. The two wafers were separated about two inches by extending the mounting screws and shaft. The new screws (two needed) were made out of brass welding rod threaded with a 6-32 die its entire length. Bushings and nuts secure the wafers to the screws. The ¼-inch shaft was extended through the rear wafer by a ¼-inch shaft coupling—the rigid type. It will be necessary to file a flat surface on the rear of the new shaft in order for it to fit into the wafer. This flat is filed carefully so that no looseness is evident while turning the switch. If the rear wafer is loose it may be tightened by shimming the shaft.

Switch *SA1-2* is mounted toward the rear of the chassis and the front shaft is extended to the front panel bushing by a flexible insulated coupling. Only five positions are used on the switch at present. Additional positions are available to enable switching in other crystals and coils for extended band coverage or switching of sidebands.

Similarly, the mixer plate tank coil switch, a *Mallory Ceramic #180C*, was modified to make grouping of coils and air padders more convenient and to obtain symmetrical tie points for the coax cable from each of the coil links, by removing the two outer wafers and bushings and placing a small 5/16 inch length bushing on each of the mounting screws behind the first wafer section. The middle wafer is then installed against these bushings and secured with a nut. The rear wafer section is mounted at the extreme end of the shaft and mounting screws. It is best to place small rubber or fibre insulators against all the ceramic wafers to prevent cracking of the brittle material.

Coils

The mixer tank coils and associated links were made from *B & W Miniductor* stock *#3014* and *#3010* respectively. The end links are semi-adjustable in that they can be slid in and out of the coil. The four polystyrene spacers of the link are oriented with those of



Close up of under-chassis view

the coils. It will be necessary to *flatten* the outer insulation of the link made of *#3010* to permit a snug fit wtih the coil made of *#3014*. This can be accomplished easily using either a clean hot soldering iron or a file.

In cutting coils *L8*, *L10*, *L12* and *L14*, leave two extra turns on the "cold" end (link side) and one extra turn on the "hot" side. Unwind these extra turns and use the wire to make the connections to the switch and ground points. Cut off the excess wire. Do not trim the extra length of insulation protruding on the cold side as the link will fit into this part giving it a wide range of adjustment. The unused

portion of insulation projecting on the hot side may be cut off near the coil proper. The links are coupled with 72-ohm coax to the two front wafers of bandswitch *SB*. The center conductor goes to *SB2* and the outer braid to *SB3*, which serves as a convenient tie point for the coax line.

After the links are mounted and adjusted they may be permanently secured with polystyrene cement, or a slight touch of the soldering iron to the adjoining insulation will do the trick.

Though no integral power supply was included, one could easily be built on the space available. The power supply is not critical and any available with a voltage output from 350 to 700 volts d.c. at 100 ma. or more would work satisfactorily. The filaments require 6.3 volts at 1.35 amp. The bias may be obtained either from a battery or an electronic bias pack.

Tuning

Connect the power supply as shown in the schematic. The B+ may vary within the range shown, as may also the bias voltage. It is suggested that –45 volts (battery will do) be used with B+ voltages up to 550 volts. For higher B+ voltages use a 67.5 volt or 90 volt battery in order to keep the 807W plate dissipation within limits.

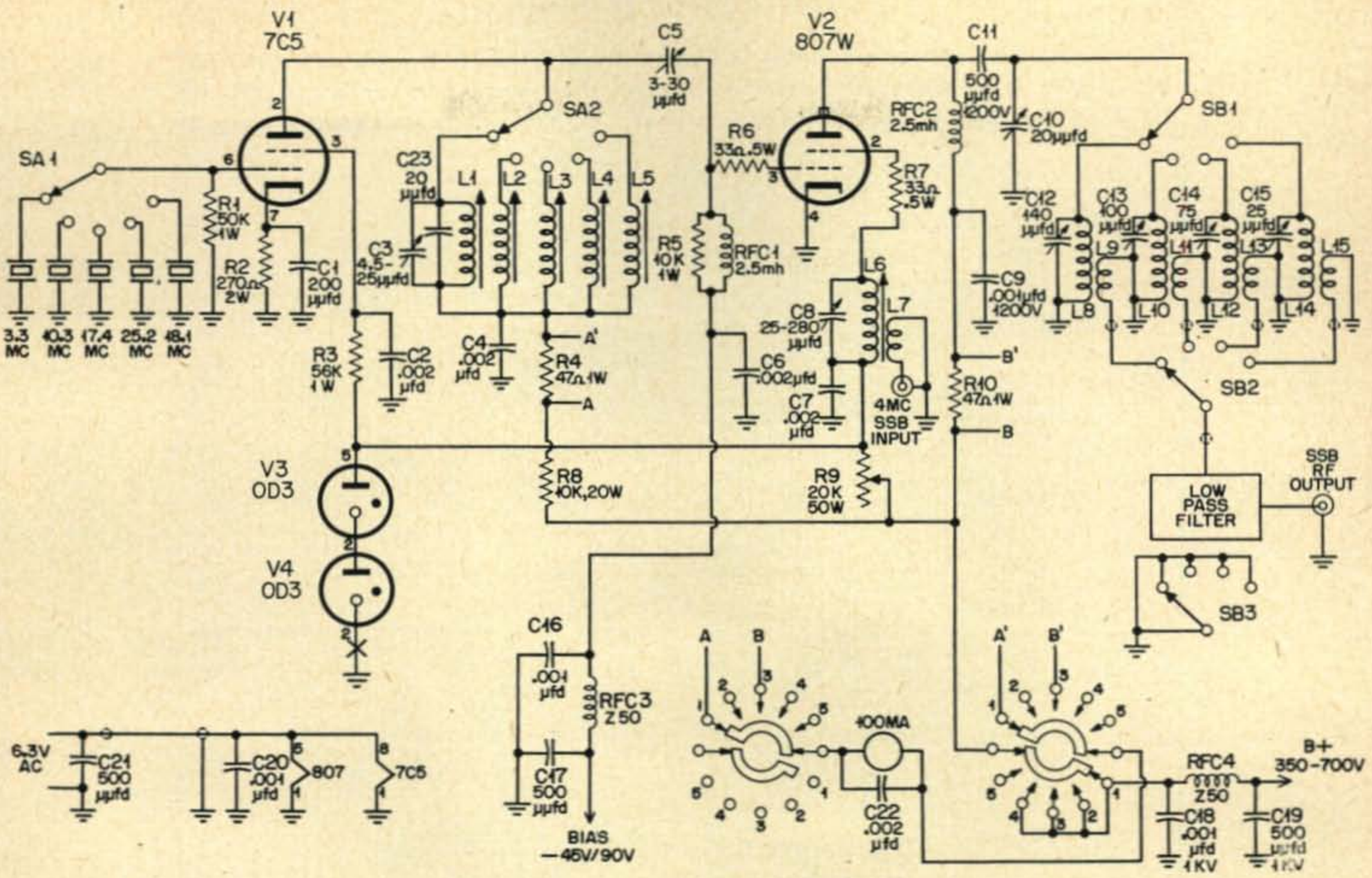
The first step is to adjust *R9*, the limiting resistor for the regulator tubes. A convenient way to do this is to break the circuit at *X* (*V4*, last OD3 to ground) and install a milliammeter. Adjust *R9* until 12-15 ma. current flows. Remove the meter and close the circuit. This adjustment is now complete and the regulators should remain fired under any load. As a reminder, during any adjustment involving contact with the high voltage, be sure to *Switch Off For Safety*.

The next step is to adjust the crystal oscillator circuit for oscillation. Throw bandswitch *SA* to the 40-meter position, which selects the 3.3-Mc crystal and associated plate coil *L1*. At this point condenser *C5* should be set for *minimum* capacity until all the crystals are oscillating properly. With an absorption-type Wavemeter or receiver as an indicator, adjust the slug of *L1* for oscillation at 3.3 Mc. Repeat this operation for the other band positions until all the crystals are operating on their correct frequencies.

To adjust for correct oscillator input to the 807W, proceed as follows: With the meter switched into the plate circuit of the 807W, throw bandswitch *SA* to the 10-meter position. The crystal should be operating at this point on 25.2 Mc. Gradually increase the capacity of *C5* until about 30-50 ma. of plate current is indicated. The slug of *L4*, as with all the others, should be detuned on the high frequency side. It will probably be necessary to touch up *L4* as *C5* is increased. A point will be reached where *C5* loads the 7C5 stage too heavily, and oscillation stops. This will probably occur only on the two higher bands. Back off *C5* to the point where the 25.2-Mc crystal will remain in oscillation as bandswitch *SA* is switched back and forth. Once *C5* is set for the highest fre-

Parts List for Hi-Level Mixer

R1—50,000 ohms, 1W.
R2—270 ohms, 2W.
R3—56,000 ohms, 1W.
R6, R7—33 ohms, ½W.
R4, R10—47 ohms, 1W.
R5—10,000 ohms, 1W + 10% tolerance.
R8—10,000 ohms, 20W wire wound.
R9—20,000 ohms, 50W wire wound, adjustable.
C1—.0002 μfd mica.
C2, C4, C6, C7, C22—.002 μfd ceramic disc.
C3—4.5—25 μμfd ceramic trimmer
C5—3—30 μμfd trimmer.
C8—25—280 μμfd trimmer.
C9—.001 μfd 1200v mica.
C11—.0005 μμfd 1200v mica.
C10 — 20 μμfd variable (*Hammarlund* MC-20-S).
C12—140 μμfd air padder (*Hammarlund* APC-140).
C13—100 μμfd air padder (*Hammarlund* APC-100).
C14—75 μμfd air padder (*Hammarlund* APC-75).
C15—25 μμfd air padder (*Hammarlund* APC-25).
C16, C20—.001 μfd ceramic disc.
C18—.001 μfd ceramic disc, 1000v.
C19—500 μμfd ceramic disc, 1000v.
C17, C21—500 μμfd ceramic disc.
C23—20μμfd tubular ceramic.
RFC1, RFC2 — 2.5 mh Choke (*National R-100*).
RFC3, RFC4 — *Ohmite Z50 Choke.*
SA1-2—Modified *Centralab* Miniature Steatite Switch PA-2005 (2-gangs, 2-poles, 11-pos/pole).
SB1-2-3 — Modified *Mallory* Ceramic Switch #180C (3-gangs, 7-poles, 11-pos/pole).
SC1-2 — *Mallory* ceramic Switch #177C (2-gangs, 4 poles, 5-pos/pole).
CRYSTALS:
25,225 kc. (10-meters) (*Bliley AX-3*).
18,100 kc. (20-meters) (*PR 2XP*).
17,455 kc. (15-meters) (*PR 2XP*).
10,300 kc (20-meters) (*PR 2XP*).
3,300 kc. (40-meters) (*JK H-73*).
Meter—100 ma. d.c., 2½ inch (*Triplett* Rectangular).
L1—3.300-Mc osc. coil, 60t #30 *Formvar* ½ inch diameter close-wound on *CTC* slug-tuned LS4 coil form.
L2—10.300-Mc osc. coil, 30t #28 *Formvar* ½ inch diameter close-wound on *CTC* slug-tuned form LS4.
L3—17.455-Mc osc. coil, 17t #28 *Formvar* Scramble Wound 3/16 inch long on *CTC* slug-tuned form LS3.
L4—25.225-Mc osc. coil, 11t #28 *Formvar* scramble-wound ⅛ inch long on *CTC* slug-tuned form LS3.
L5—18.100-Mc osc. coil, 16t #28 *Formvar* scramble-wound 3/16 inch long on *CTC* slug-tuned form LS3.
L6 — 3.8 — 4.0 Mc input coil, 42t #28 *Formvar* close-wound on *CTC* slug-tuned form LS4.
L7—Link, 6t #22 Enamel close-wound over cold end of L6.
L8—40-meter output coil, 15¼t 1-inch diameter 8t/inch (*Miniductor* #3014).
L9—Link, 3t ¾-inch diameter 8t/inch (*Miniductor* #3010) (See Text).
L10 — 20-meter output coil, 7¼t 1-inch diameter 8t/inch (*Miniductor* #3014).
L12 — 15-meter output coil, 6t 1-inch diameter 8t/inch (*Miniductor* #3014).
L14 — 10-meter output coil, 5t 1-inch diameter 8t/inch (*Miniductor* #3014).
L11, L13, L15, 2t ¾-inch diameter 8t/inch (*Miniductor* #3010) (See Text).
Fixed Condensers, unless shown otherwise, are 600 wvdc ratings.



Schematic for the W3NFT Hi-Level SSB Mixer

quency in use it will not need to be adjusted again.

Next switch *SA* to the 15-meter position and tune slug *L3* (17.45 Mc) on the high frequency side until 50 ma. is indicated. Similarly, tune *L2, L5* and *L1* until the resting plate current is 50 ma. This completes the oscillator adjustment.

The following procedure may be used to adjust the 807W input and output circuit: With bandswitches *SA* and *SB* set to the 40-meter position, connect the SSB exciter, tuned to 3950 kc, and insert a slight amount of carrier. Using the receiver as a monitor, a beat note should be heard at 7250 kc. Adjust slug *L6* and *C8,* the input tank, until the 807W plate current is maximum. Once the input circuit is peaked it need not be tuned again, since this adjustment holds for all bands.

Set the main tuning condenser *C10* to its mid-capacity position and attach a dummy load. Using the receiver S-meter or a Wavemeter tuned to 7250 kc, adjust air padder *C12* until maximum output is indicated. The 807W plate current will show a slight dip provided it is not too heavily loaded. The link *L9,* at the cold end of *L8,* should not be coupled too tightly. It may be adjusted for optimum coupling after the exciter is coupled to the final amplifier grid circuit.

Switch *SA* and *SB* to the 20-meter positions and go through similar adjustments of the 14-Mc output circuit as described above. The 15-meter and 10-meter adjustments are similarly made.

Depending on the type of final input circuit employed the reflected impedance to the mixer, in the 40-meter position, may be such that *C10* will not resonate within its narrow tuning range. This can easily be corrected by either increasing or decreasing padder *C12* until *C10* again covers the normal tuning range desired.

Operation

Once the adjustments are completed the injected carrier and load may be removed and the mixer output may then be attached to the final amplifier. The 4-Mc injection level is controlled by varying the audio gain control of the SSB exciter. All that is needed to tune the Hi-Level Mixer is to switch to the proper band and adjust the main tuning control *C10* to resonance as indicated by maximum grid current to the following stage. It will not be necessary to check the mixer unit for correct output frequency when changing bands, providing the original adjustments were made correctly, since the tuning range of *C10* is small enough to prevent resonating to any spurious mixture, harmonic or crystal fundamental signal.

Operating Data

Table II shows typical measurements made on the 807W mixer stage with different grid bias operating with maximum *linear* output into a dummy load.

[*Continued on page 102*]

Last Minute Forecast

A moderate ionospheric disturbance is forecast for May 15-17. The period May 23-25 is expected to be unstable. Exceptionally good short-wave propagation is forecast for May 2-5 and 28-31 with the remainder of the month seasonably normal.

ALL TIMES IN EST

EASTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1300-1700 (2)	0600-1000 (2) 1000-1300 (3) 1300-1800 (4) 1800-2000 (2)	0000-0600 (2) 0600-1300 (1) 1300-1700 (2) 1700-2100 (4) 2100-0000 (3)	1800-1930 (2) 1930-0100 (4) 2000-0000 (2)*
Southern Europe & North Africa	1300-1730 (2)	0600-0800 (3) 0800-1300 (2) 1300-1800 (4) 1800-2100 (2)	0400-0700 (3) 0700-1400 (1) 1400-1700 (3) 1700-2100 (4) 2100-0400 (2)	1800-1930 (2) 1930-2300 (4) 2300-0200 (3) 2000-0000 (2)*
Near & Middle East	1200-1430 (1)	0600-1200 (1) 1200-1700 (3)	1500-1700 (2) 1700-1930 (4) 1930-0300 (2)	1900-2300 (2) 2000-2200 (1)*
Central & South Africa	1100-1630 (3)	1000-1230 (1) 1230-1630 (4) 1630-1930 (2) 2200-0200 (2)	1330-1630 (2) 1630-2030 (4) 2030-0230 (2)	1900-0030 (2) 2000-2230 (1)*
Central & South America	1000-1400 (2) 1400-1700 (4) 1700-2100 (2)	0600-0830 (3) 0830-1500 (2) 1500-1630 (3) 1630-2200 (4) 2200-0200 (2)	0100-0800 (3) 0800-1700 (2) 1700-0100 (4)	1900-2200 (2) 2200-0400 (3) 0400-0600 (2) 2000-0300 (2)*
South East Asia	NIL	0630-0830 (1) 1800-2100 (1)	0600-0900 (1) 1800-2200 (1) 2200-0100 (2)	NIL
Australasia	1900-2130 (1)	0700-1000 (1) 1700-1900 (2) 1900-2230 (3)	0630-0800 (3) 0800-0930 (2) 2130-2330 (2) 2330-0200 (3)	0200-0600 (1) 0600-0730 (2) 0300-0530 (1)*
Guam & Pacific	NIL	1700-2100 (2)	0600-0730 (1) 2100-2300 (1) 2300-0200 (2)	2300-0400 (1)
Japan & Far East	NIL	1700-2100 (2)	0500-0800 (2) 1730-1930 (2) 1930-0100 (3) 0100-0230 (2)	2300-0500 (1)
Antarctica	NIL	1300-1430 (2) 1430-1630 (3) 1630-1800 (2)	1600-1730 (2) 1730-2000 (4) 2000-2200 (3) 2200-0630 (2)	2100-0300 (2) 0300-0500 (1) 2130-0330 (1)*

ALL TIMES IN PST

WESTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Europe & North Africa	NIL	1000-1300 (1) 1300-1500 (2)	1400-1600 (1) 1600-2100 (2) 2100-2300 (3)	1800-2200 (1) 1900-2100 (1)*
Central & South Africa	1500-1700 (2)	1100-1300 (1) 1300-1500 (2) 1500-1700 (4) 1700-1900 (2)	1300-1600 (2) 1600-1900 (4) 1900-2130 (2) 2130-0000 (3)	1800-2200 (2) 1900-2100 (1)*
South America	1000-1400 (3) 1400-1800 (4) 1800-2200 (2)	0600-0800 (3) 0800-1400 (2) 1400-2000 (4) 2000-2300 (2)	0600-1200 (1) 1200-1600 (2) 1600-2000 (4) 2000-0600 (3)	1800-2000 (2) 2000-0300 (3) 2800-0100 (2)*
Guam & Mariana Islands	1600-2000 (3)	0800-1200 (2) 1200-1400 (3) 1400-1900 (2) 1900-2200 (4) 2200-0000 (2)	0700-0900 (4) 0900-1200 (3) 2200-0000 (2) 0000-0200 (4) 0200-0700 (2)	0100-0500 (3) 0200-0400 (2)*
Australasia	1200-1900 (3) 1900-2030 (4) 2030-2200 (2)	0700-0900 (2) 1200-1400 (3) 1400-1800 (2) 1800-2200 (4) 2200-0000 (2)	0100-1100 (3) 1900-2300 (3) 2300-0100 (4)	2200-0400 (2) 0400-0700 (3) 2300-0400 (1)*
Japan, Okinawa & Far East	1100-1300 (1) 1800-2100 (3)	2200-0200 (2) 0900-1200 (2) 1200-1400 (4) 1400-1800 (2) 1800-2200 (4)	0800-1100 (3) 1100-2000 (1) 2000-2200 (2) 2200-0800 (2)	0100-0430 (3) 0130-0400 (2)*
Philippine Islands & East Indies	1200-1600 (2) 1600-2100 (3)	0800-1200 (3) 1200-2000 (2) 2000-0100 (3)	0000-0800 (2) 0800-1200 (3) 1200-1400 (2)	0300-0600 (1)
Malaya & South East Asia	1200-1600 (2) 1600-2100 (3)	0800-1400 (3) 1400-2200 (2) 2200-0200 (3)	0100-0400 (1) 0400-0800 (2) 0800-1400 (3)	0400-0700 (1)
Hong Kong, Macao & Formosa	1600-2100 (3)	0800-1100 (2) 1100-1400 (3) 1400-2100 (2) 2100-0300 (3)	0400-0600 (2) 0600-1200 (3) 1200-1400 (2) 2300-0400 (3)	0200-0600 (2) 0300-0500 (1)*

ALL TIMES IN CST

CENTRAL USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1400-1800 (1)	0530-1200 (2) 1200-1400 (3) 1400-1700 (4) 1700-2000 (2)	0200-0500 (2) 0500-1330 (1) 1330-1630 (2) 1630-2000 (4) 2000-0200 (3)	1800-2000 (2) 2000-0000 (3) 0000-0130 (2) 2000-0000 (2)*
Southern Europe & North Africa	1400-1600 (2)	0530-0730 (3) 0730-1200 (2) 1200-1700 (4) 1700-2000 (2)	0000-0700 (2) 0700-1400 (1) 1400-1600 (2) 1600-2000 (4) 2000-0000 (3)	1900-2000 (2) 2000-0000 (3) 2000-2300 (2)*
Central & South Africa	1100-1600 (3)	1000-1200 (1) 1200-1600 (4) 1600-1900 (2) 2300-0100 (2)	1330-1600 (2) 1600-2000 (4) 2000-0200 (2)	1900-0000 (3) 2000-2200 (2)*
Central America & Northern S. America	0900-1500 (3) 1500-1800 (4) 1800-2000 (2)	0600-0800 (4) 0800-1600 (2) 1600-2100 (5) 2100-0200 (2)	0500-0730 (4) 0730-1600 (2) 1600-2100 (5) 2100-0000 (4) 0000-0500 (3)	1900-2200 (2) 2200-0400 (3) 0400-0630 (2) 2000-0300 (2)*
South America	1000-1500 (3) 1500-1800 (4) 1800-2000 (2)	0600-0900 (4) 0900-1400 (2) 1400-2100 (4) 2100-0000 (2)	0100-0800 (3) 0800-1600 (2) 1600-0100 (4)	1900-0430 (3) 0430-0630 (2) 2000-0400 (2)*
Japan & Far East	NIL	1500-1800 (2) 1800-2100 (3)	0600-0600 (2) 1600-2000 (2) 2000-0000 (3) 0000-0300 (1)	0000-0530 (1)
South East Asia	NIL	0700-0900 (1) 1600-2100 (2)	0600-0600 (1) 1700-2030 (1) 2030-0000 (2)	NIL
Hawaii	1800-2100 (2)	1000-1500 (2) 1500-1800 (3) 1800-2100 (4) 2100-2300 (2)	0700-0930 (3) 0930-1900 (2) 1900-0100 (5) 0100-0300 (3) 0300-0700 (2)	2200-0700 (4) 2300-0600 (3)*
Australasia	1800-2100 (1)	0700-0900 (2) 1500-1630 (1) 1630-2100 (2) 2100-2300 (3)	0600-0800 (3) 0800-0930 (2) 2100-0000 (2) 0000-0200 (4) 0200-0600 (2)	0200-0530 (2) 0530-0700 (3) 0230-0500 (2)*

CQ PROPAGATION CHART (SHORT-SKIP)
DISTANCE (MILES)

BAND (METERS)	50-250	250-750	750-1300	1300-2400
10	--	--	1000-1700 (2)	1700-2200 (3)
15	--	0900-1600 (1)	0900-2100 (3)	0900-1500 (3) 1500-2300 (4) 2300-0100 (2)
20	--	0800-1100 (2) 1100-1500 (3) 1500-2100 (2)	0700-1100 (3) 1100-1600 (4) 1600-2200 (5) 2200-0000 (2)	0700-1000 (3) 1000-1700 (4) 1700-0200 (5) 0200-0700 (2)
40	0700-0900 (3) 0900-1400 (4) 1400-2100 (5) 2100-2300 (3)	0700-0900 (5) 0900-1700 (4) 1700-2100 (5) 2100-0700 (2)	0200-0900 (3) 0900-1900 (2) 1900-2300 (4) 2300-0200 (5)	0600-0900 (3) 1900-2200 (3) 2200-0600 (5)
80	0000-0600 (4) 0600-1100 (5) 1100-1700 (3) 1700-0000 (5)	0500-0800 (4) 0800-1700 (1) 1700-2100 (4) 2100-0500 (5)	0500-0700 (3) 1900-2200 (3) 2200-0500 (5)	2200-0000 (2) 0000-0500 (4) 0500-0700 (2)
160	1800-2000 (4) 2000-0800 (5) 0800-1000 (3)	1900-2100 (2) 2100-0500 (5) 0500-0900 (2)	2000-2300 (2) 2300-0500 (4)	2300-0500 (2)

SYMBOLS FOR NUMBER OF DAYS CIRCUIT PREDICTED TO OPEN:

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days

*Indicates time of possible 80-Meter openings.

The CQ Propagation Charts are based upon a CW radiated power of 150 watts and are centered on Washington, D. C., St. Louis, Mo., and Sacramento, California. These forecasts are calculated from basic ionospheric data published by the CRPL of the National Bureau of Standards and are valid through June 15, 1956. Refer to column for explanation of "Short-Skip" Charts.

PROPAGATION

Forecasts By:
George Jacobs, W3ASK/W2PAJ
607 Beacon Road
Silver Spring, Md.

GENERAL SHORTWAVE PROPAGATION CONDITIONS: MAY

Summer propagation conditions, and the continued rapid rise in solar activity will result in a considerable improvement on 20 meters during May, with the band expected to remain open around the clock. Ten and 15 Meter conditions will remain good, especially during the late afternoon, and good 40 Meter propagation conditions are expected during the hours of darkness. A sharp increase in the occurrence of sporadic-E clouds in the ionosphere should result in considerably more "short-skip" type openings during May and the coming summer months.

The following is an overall picture of band conditions forecast for May, 1956, with a discussion of the qualitative changes in each amateur high frequency band from month to month. For specific times of band openings for a particular DX or Short-Skip circuit, refer to the *CQ Propagation Charts* on the opposite page.

6 Meters:

Occasional openings are expected between skip distances of 1000 and 1400 miles as a result of the increase in sporadic-E type propagation. With the exceptionally rapid rise in sunspot activity there is also the possibility that this band may open to South America during the late afternoon or early evening hours following the breakup of severe ionospheric storms, or following the occurrence of considerable auroral activity. The regular F-2 layer MUF rises above 42 Mc on several paths between Hawaii and the South Pacific, and during days of exceptionally good short-wave propagation conditions there is a good chance that the MUF will reach as high as the six meter band between the hours of 0200-0600 GMT, or 6-10 PM HST.

10 Meters:

A considerable increase is expected in short-skip, sporadic-E propagation between distances of 750 to 1300 miles. Regular layer F-2 short-skip propagation, between skip distances of 1300 to 2400 miles, should be possible on several days with conditions optimum between 5 to 10 PM, *local standard time*. DX conditions remain fairly good from around noon to shortly after sundown. The band will open less often than during the winter months, but will remain open considerably later in the day.

15 Meters:

Good world-wide DX is expected daily from shortly after sunrise, to considerably after sunset, *local standard time*. During periods of exceptionally good propagation conditions, the band may remain open on several circuits until past midnight. A considerable increase in sporadic-E, short-skip, propagation is expected between distances of 250 to 1300 miles. Regular layer short-skip propagation between 1300-2400 miles, is expected from about noon to midnight, peaking in the late afternoon and early evening hours.

20 Meters:

Exceptionally good world-wide DX is expected around the clock on several days during May. Conditions will be optimum during the late afternoon and early evening hours, and also shortly after sunrise, *local standard time*. Short-skip propagation is also expected around the clock, with the skip distance as short as 250 miles at noon time, and extending up to 2400 miles during the late afternoon and evening hours.

40 Meters:

Fairly good DX propagation is expected from shortly after sunset to about sunrise, *local standard time*. Seasonally higher atmospheric noise levels will result in higher static levels on this

band. While opening for DX considerably later in the evening, the band is expected to remain open with more consistency and possibly stronger signals than during the winter months. Short-skip propagation should be possible around the clock, with the skip distance as short as 50 miles during the late afternoon hours. Daytime absorption will limit maximum range on this band to about 750 miles, with the skip increasing to beyond 2400 miles as the hours of darkness approach.

80 Meters:

Generally poor to fair night time DX conditions are expected to most areas of the world from after sunset until shortly before sunrise, *local standard time*. Static levels will be noticeably higher and signals levels somewhat weaker as a result of seasonally higher ionospheric absorption levels. During the daylight hours, absorption will limit maximum range on this band to about 200 miles or so, increasing to beyond 2400 miles during the hours of darkness.

160 Meters:

With increased ionospheric absorption due to seasonal propagation variations, and as a result of the rapid rise in sunspot activity, DX conditions will be extremely poor on this band during May and the summer months. During the daylight hours skywave propagation will not be possible at all, and communication will be limited to the groundwave component which can be heard only a few miles from the transmitter. During the hours of darkness, as solar absorption decreases considerably, skywave propagation up to distances of 1300 miles should be possible nightly, and when static levels are exceptionally low the skip may extend upwards to 2400 miles.

CQ Short-Skip Propagation Chart

Short-skip propagation conditions, for paths less than 2400 miles long, will appear in CQ *every other month*. This month's *Chart*, appearing on the same page as the regular *CQ DX Propagation Charts*, is a forecast for May and June, 1956. The short-skip propagation forecast is based upon a CW radiated power of 75 watts, using a dipole antenna a half wavelength above ground. Calculations are based upon the approximate center latitude of the United States and actual band conditions in almost any area of the United States should not vary more than an hour or so from the times shown in the *Chart*. All times are given in *Local Standard Time*. This means that if you live in California, the times shown are PST, if you live in N.Y.C. the times shown are EST. The symbols for the number of days that a particular path is expected to open are the same as those used for the *DX Charts*. The author would appreciate comments and suggestions from readers and users of this particular forecast.

Sunspot Data

The sunspot numbers continue to soar at an unprecedented rate. The monthly Zurich sunspot number for February, 1956, was reported as 122.6. This is the highest monthly sunspot number observed since November, 1949, and resulted in a 12-month smoothed sunspot number of approximately 49, centered on August, 1955. Actual sunspot activity is exceeding by far, even the best estimates of a few months ago. Accordingly, short wave radio propagation conditions, especially on the 10 and 15 Meter bands, have been considerably better these past few months than previously predicted. Solar activity, and improved propagation conditions on the higher frequencies, up to the 6 Meter band, are expected to continue to increase for at least another year.

Part 2 of "The Sunspot Story: Cycle 19" will appear in next month's *CQ*. The effect of the rapid rise in sunspot activity in relation to once in a lifetime propagation conditions on the various amateur bands will be discussed as well as the possibility of inter-continental DX television. Other phenomena associated with the sunspot cycle will also be discussed *. . . don't miss it.*

This month's *CQ* propagation forecast is based upon a predicted smoothed sunspot number of 96 centered on May, 1956.

Voice Of America Propagation Forecasts

The Voice Of America informs us that up to the minute propagation forecasts for radio amateurs and short wave listeners are broadcast every weekday at approximately 1805 GMT (1:05 PM EST) on the following frequencies:

21730 kc, WBOU, N. Y.
21650 kc, WLWO, Cinn.
17830 kc, WDSI, N. Y.
15280 kc, WBOU, N. Y.
15270 kc, WDSI, N. Y.
11890 kc, Tangier Relay
11790 kc, WLWO, Cinn.
9500 kc, Tangier Relay
7235 kc, Munich Relay

The forecasts are part of the English language transmission "Panorama USA."

Every *Saturday*, between 1845 to 1900 GMT

(1:45 to 2:00 PM EST), the Voice of America devotes an entire 15 minute program to amateur radio. The program, "of, by and for radio amateurs throughout the world," serves as a clearing-house for international shortwave information, including up to the minute, band by band propagation forecasts. Narrator for the program is Bill Leonard, W2SKE. Bill also serves as the program's technical writer, pooling his broad experience with beginners and old-timers alike.

Gene Kern, W2BAK, is program editor and propagation forecasts are supplied by the editor of this column, W3ASK.

The VOA amateur program is broadcast on the same frequencies as "Panorama USA" listed above. Reception reports and QSL's received from listeners to this program will be acknowledged with a distinctive VOA QSL card. Since shortwave frequency schedules are subject to frequent change, latest program schedules for this broadcast can be obtained from:

U. S. Information Agency,
Washington 25, D. C.
Att: IBS/RF

Total Solar Eclipse

A total eclipse of the sun is one of nature's most spectacular events. The total eclipse of the sun also has special signficance to shortwave radio. Only during such an event is it possible for the ionizing radiation of the sun, (which is responsible for forming the various layers of the ionosphere), to be cut off in the middle of the day. This affords the opportunity to observe the effects upon shortwave radio circuits as rapid changes in ionization takes place.

Radio observations made during past total eclipses of the sun have resulted in the formulation of much of our present theories concerning ultra-violet radiation from the sun and its influence upon the ionosphere. On June 8, 1956, a total eclipse will occur that should be visible over the South Pacific Ocean. While not visible as a total eclipse in this country, its influence upon shortwave radio transmission from Australia, and the South Pacific, will no doubt be noticed here. I would be very interested in receiving reports of any unusual effects observed on these circuits during the period of total eclipse.

Daylight Savings Time

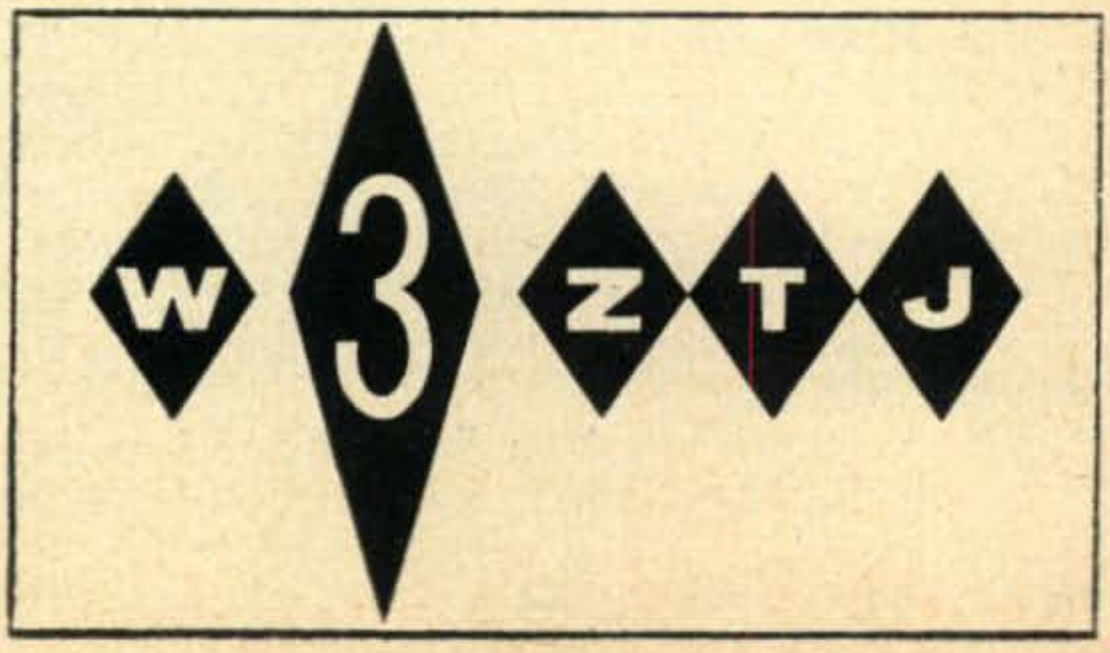
During April and May many communities in the United States go on *daylight savings time*. All times used in the *CQ* forecasts are given in *local standard time*. If your community is now on daylight savings time remember to *add one hour* to all times shown in the forecast. ■

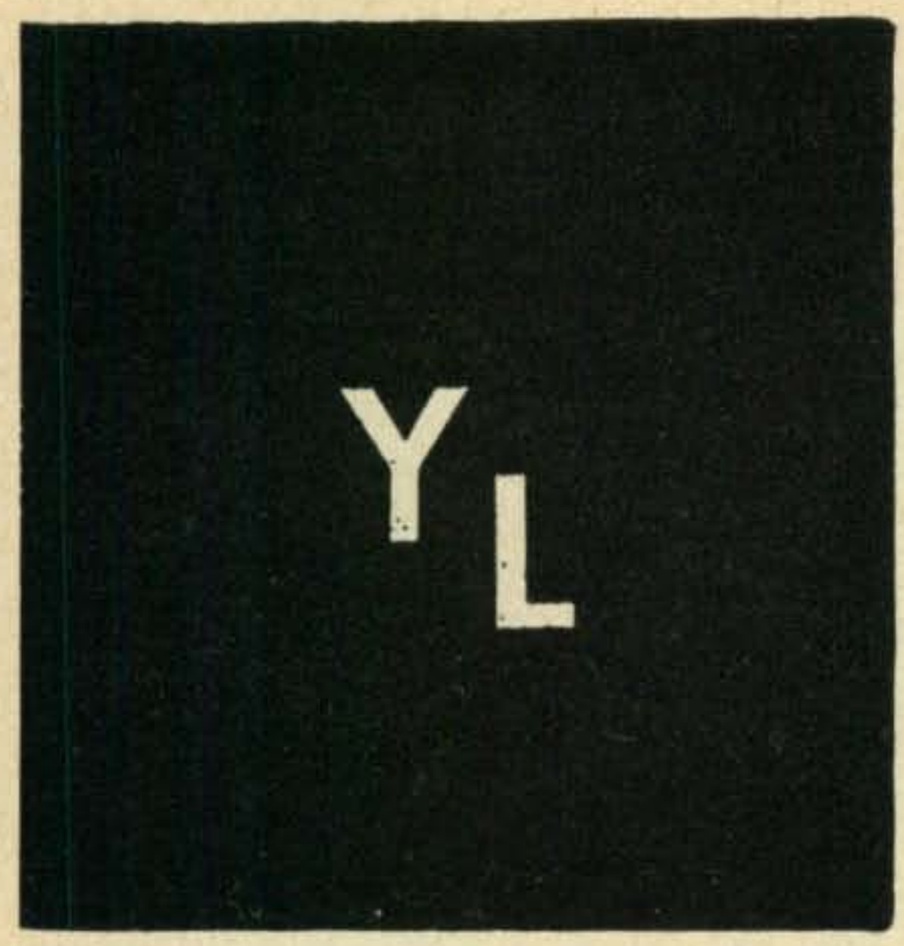
Monthly QSL Contest Winner

and runners up

This month's award (as usual, a 2-yr subscription to *CQ*) goes to FB8ZZ, of Latitude 37°50S, Longitude 77° E. (know where *you* are, besides just North or South of the Equator?)

QSL Contestmanship launches into its second year about now. Unsurprisingly enough, the thousands of cards received to date classify from Terrific through Mediocre to (*Burrrlap*!) How about yours?





Monitored by

Louisa B. Sandbo, W5RZJ

Jicarilla Apache School, Dulce, New Mexico

YLRL Awards

The Young Ladies' Radio League offers these awards to any amateur anywhere in the world who can qualify for them: WAS/YL, YLCC, and WAC/YL. At least once a year the rules governing these awards are published in *CQ*, together with a list of the awards which have been made. The rules are listed in the accompanying boxes.

All YLs are requested to be conscientious in sending QSLs. Even if one is not personally interested in the YLRL awards, it means a great deal to those who are working for them.

WAS/YL

First of the awards to be established was WAS/YL—Worked All States, YL. To date (March '56) WAS/YL has been awarded to: W2QHH, W1FTJ, W4ARR, W8HWX, W3OP, W4SGD, W9CMC, W3MAX, W9GME, W4HLF.

WAC/YL

Since publicity on WAC/YL (Worked All Continents, YL) was published in *CQ* for June '55, interest in this award has grown tremendously. At that time W2QHH was the sole possessor of a WAC/YL certificate. Since then WAC/YL awards have been issued to: ZL1BY, G4ZU, CE5AW, VK3CX, JA1AA, G3DO.

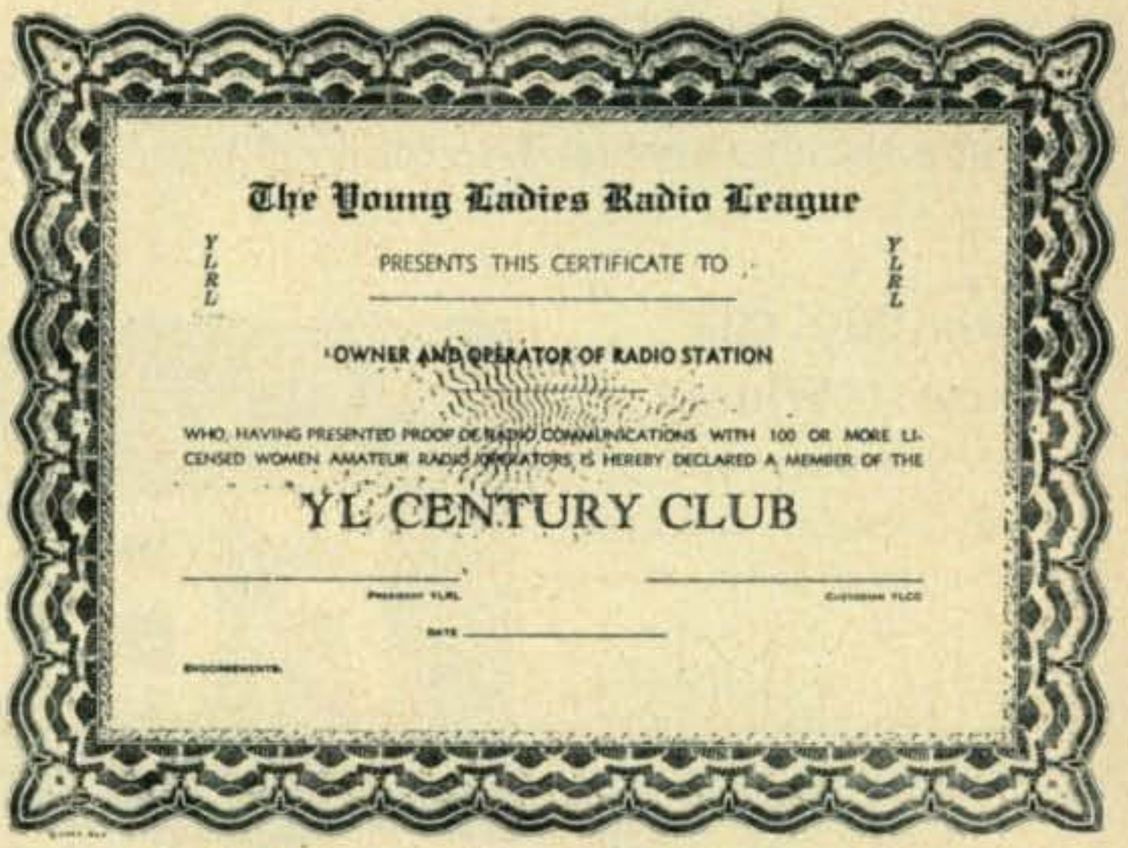
YL Club Awards

The Rhode Island YL Club offers an RIYL Certificate to any licensed OM or YL, anywhere, who makes contact with ten Rhode Island YL operators. Send list of stations worked, together with QSLs to: Ruth Parker, W1WED, 75 Ridgeway Ave., Hoxsie, R. I. The YLs worked do not have to be members of the RIYL Club.

The Young Ladies' Radio Club of Los Angeles offers the "Lad 'n Lassie" certificate to any amateur with confirmations of contacts with ten members of the club. Send your application and QSLs to "Queen of the Clan," Helene Leonard, W6QOG, 1205 South Edris Dr., Los Angeles 35, Calif. These are the current members of the Los Angeles YL club: W6's NZP, CBA, REF, QOG, KER, QGX, AKE, PJU, EHA, UHA, JCA, WSV, JMC, TDL, CEE, DPB, AVF, QOO, WRT, QYL, LBO, JZA, DXI, NAZ, JMS, SHR, QWC, FEA, MFP, SGL, KYZ; K6's: LPM, CYZ, EXQ, EXV, BUS, ANG, KCI, DWQ, ACF, OAI, ELO, IHD, BXX, GMX, DRS, HIF, HVC, IKF, JCL, EJE, ELI, GQW, QFY, KUP, INK, EIA; KN6's: JPX, JRL, PFY, KEK, LIH, PFZ, PRZ, PLB.

YLCC

The YL Century Certificate, for confirmed contacts with 100 or more YL operators, has proved most popular. Since it was established in 1953, YLCC has been awarded to 84 amateurs. The number in parentheses following calls indicates total number of YLs, gold or silver stickers having been issued for each additional 50 YL confirmations.


The Young Ladies Radio League

YLRL PRESENTS THIS CERTIFICATE TO YLRL

OWNER AND OPERATOR OF RADIO STATION

WHO, HAVING PRESENTED PROOF OF RADIO COMMUNICATIONS WITH 100 OR MORE LICENSED WOMEN AMATEUR RADIO OPERATORS IS HEREBY DECLARED A MEMBER OF THE

YL CENTURY CLUB

W1BFT	W6EHA	W8ZCV
W2QHH (500)	W8VQD	W9KA
W3JSH	W6KER	W2EEO
W8HLF (400)	W6QGX	W7GLK
W4SGD (350)	W4LAS	W6DXI
W4CKB	W7ULK (150)	W7TGG
W3MAX (200)	W8SPU	W7SFK
W7HHH (200)	W6JZA (150)	W1YNI
W8ATB (200)	W6FKH	W9RQF
W8HWX (300)	W4YYJ	W5UBW
W4ARR (250)	W4BLR (150)	W1VYH
W8HUX (250)	W1AW	K2DSW
W3OP (150)	W9GME	WØERR
W9CMC (300)	W9YBC	W7JFB
W4KYI	W3VLX	W6USG
W4VJX	W9LOY	W4BQI
W8SDD	W6PCA	W1YPH
W1VOS (150)	W5WUX	W6QYL/4
WØTAB	W8FPT	K5BNQ
W6WRT (200)	K2IWO	W5RYX
W3RXV	W1OPZ	WØOMM
W9OMM (200)	W2NIY	W3YTM
W7RT	W7VIU	W7RVM
W9NN (150)	W7MWR	K6EXQ
W2OWL (150)	W3UUG	W5EGD
W8MBI (150)	W4RIG	K5ADQ
WØHFP	W6NAZ	W7VYG
W7FWR	WØLLU	W1WPX

WAC/YL AWARD

1. The Young Ladies Radio League issues a Worked All Continents-YL certificate to any licensed amateur in the world.
2. Two-way communication must be established on the amateur radio bands with the six continents: North America, South America, Europe, Africa, Asia, and Oceania. Any and all authorized amateur radio bands may be used. Cross-band contacts are permitted; contacts may have been made over any period of years.
3. Contacts with all six continents must be made with duly licensed woman operators.
4. Contacts with all six continents must be made from the same location. Within a given community, one location may be defined as from places no two of which are more than 25 miles apart.
5. Six QSL cards or other written confirmations, showing proof of contacts, must be submitted with application. IRC's, or the equivalent thereof, must be sent with the confirmations to finance their return by first-class mail. The YLRL will not be responsible for any loss or damage to same.
6. Decisions of the WAC/YL custodian regarding interpretations of these rules as here stated, or later amended, shall be final.
7. Send applications and confirmations for this award to: Opal Jones, W6PCA, WAC/YL Custodian, Route 1, Box 180, Esparto, California.

YLRL Directory

YLs or OMs who are interested in working for any of the YL awards will find of special value the *YLRL Directory*. It lists over 500 members of YLRL with call, QTH, bands operated and other details where such were available. Copies of the *Directory* may be obtained for $1 from W6DXI, Gladys Eastman, 735 Glen Ave., Glendale 6, Calif.

The Ladies' Amateur Radio Klub (LARK) of Chicago offers a LARK certificate to any amateur working ten members of their club.

W4SGD, Katherine Johnson, custodian of YLCC.

W6PCA, Opal Jones, custodian of WAC/YL award.

Exchange of QSL cards is unnecessary. Just send a list of the ten contacts to Gladys Jones, W9MYC, 4232 Hampton Ave., Western Springs, Ill. These are the calls of members known to be active on the air: W9's BCA, IFT, LOY, SPI, TLJ, LAS, BCB, MYC, UON, QXI, IWP, KQC, YBC, SJR, YWH, AYX, TMZ, YXK, LDK, SYX, AQB, LKD, ZXZ, RUJ, LRT, NCZ, WOI, MAS; KN9's ALU, BUS; WN9TDC; WØLHP; W8's UAP, ATB; W4's DEV, ZMV; W5's ZUD, VWW.

Award Custodians

Custodian of the WAC/YL award is Opal Jones, W6PCA, of Esparto, Calif. Since receiving her license in '52 Opal has earned an impressive list of awards, and almost all of them on CW. She holds WAS, WAC, YLCC (phone and CW), KH6-CC (KH6 Century Club), WHARC (Worked Hilo Amateur Radio Club) with endorsement 1st YL Stateside, WJDXRC (Worked Japan DX Radio Club), with endorsement 1st YL, W25Nev, CAA, RCC, Lad 'N Lassie (phone), 25 CPC. She won the CW portion for her section in the VE/W contest in '55. W6PCA consists of a Viking II and VFO and the receiver is a BC-348J. Opal, who formerly worked in broadcast radio, enjoys playing the Hawaiian steel guitar, likes carpentry, crocheting, quilting and collecting old coins.

As might be guessed, YLCC Custodian Katherine M. Johnson, W4SGD, of Fuquay Springs, N. C., is especially interested in contacting YLs. She holds No. 5 YLCC with five endorsements, for a total of 350 YL confirmed contacts. She was No. 6 to make WAS/YL and she also holds WAS for 75 phone. Katherine won the YL-OM contest in 1952. Formerly NCS, she is now secretary of the Tar Heel Emergency Net, holds RACES license and is

YL Century Certificate

The YL Century Certificate for confirmed contacts with stations operated by 100 or more different licensed women amateur radio operators is issued by YLRL upon compliance with the following rules.

1. Two-way communication must be established on authorized amateur bands with stations, mobile or fixed, operated by 100 *different* licensed women amateurs. Any and all amateur bands may be used.
2. All contacts must be made from the same location. Within a given community, one location may be defined as from places no two of which are more than 25 miles apart.
3. Contacts may be made over any period of years, provided only that all contacts are from the same location as defined in 2.
4. Contacts with YLs anywhere in the world are recognized, provided only that confirmations clearly indicate the stations contacted were operated by duly licensed women amateur radio operators.
5. 100 QSL cards, or other written communications from the stations worked confirming the necessary two-way contacts, accompanied by a list of claimed contacts, including the full name of the operator, alphabetically arranged, and the date and time of contact, must be submitted by the applicant directly to the YL-CC custodian. Sufficient postage must be sent with the confirmations to finance their return by first class mail. The YLRL will not be responsible for any loss or damage to same.
6. Endorsements: Confirmations of contacts, accompanied by alphabetical list, as described above, from stations operated by additional YLs may be submitted for credit each time 50 additional confirmations are available. Endorsements will be made to the original certificate as application is approved. *Gold* stickers will be awarded to applicants who have worked 50 additional contacts from the same location (or within a 25-mile radius). *Silver* stickers will be awarded to those who have moved from the location in which they earned their original certificate.
7. Decisions of the YL-CC custodian regarding interpretation of these rules as here stated or later amended, shall be final. All inquiries regarding cards, applications, or the certificate should be addressed to her. Address: Katherine M. Johnson, W4SGD, Box 666, Fuquay Springs, N. C.

CD net control for North Carolina. She also has a Public Service Award for work during the hurricanes. W4SGD runs 500 watts and she would be happy to make skeds with any YLs on 80, 40, 20 or 15 meters, phone or CW, but she prefers phone. It was in 1950 that Katherine joined her OM, W4PZE, in his hobby. Their son is W4UJI and they have two daughters.

WAS/YL Custodian Lou Littlefield was very active as W1MCW in Maine from 1939 until she and her OM, W1CRU, moved to Ft. Lauderdale, Fla., this past winter, working mostly 10 and 20 phone with a kw rig. She holds DXCC No. 18, WAS, WAC, CPC, and certificates for several contests. Lou has served as VP, P/C and D/C of YLRL. Other interests are collecting mint mark Lincoln pennies, U.S. stamps, and growing flowers. Her new call is K4HEF.

WAS/YL

YLRL offers a WORKED ALL STATES-YL award. Here are rules for earning the certificate.

1. The WAS/YL award, Worked All States-YL, is available to all amateurs.
2. Two-way communications must be established on the amateur bands with all 48 of the United States. Any and all amateur bands may be used. A QSL from the District of Columbia may be submitted in lieu of one from Maryland.
3. Contacts with all 48 states must be made with stations operated by licensed women operators.
4. Contacts with all 48 states must be made from the same location. Within a given community one location may be defined as from places no two of which are more than 25 miles apart.
5. Contacts may be made over any period of years provided only that all contacts are from the same location as defined in #4.
6. 48 QSL cards, or other written communications, from stations worked confirming the necessary two-way contacts, should be submitted by the applicant to: Lou Littlefield, K4HEF, P.O. Box 5098, Fort Lauderdale, Florida. Sufficient postage must be sent with the confirmations to finance their return. The YLRL will not be responsible for any loss or damage to same.

YL Get-Togethers

The Sixth Midwest YL Convention will be held May 25-27 at the Hotel Capri in St. Paul, Minn. with the North Star YL Club of the Twin Cities as hostess. All YLs are invited. For further details check April *CQ*.

The Women Radio Operators of New England plan to have their annual Spring Luncheon in downtown Boston on May 26. At this writing the hotel hadn't been decided upon, but further details may be obtained from Barbara Harrington, W1TRE, Topsfield, Mass.

[*Continued on page 100*]

RTTY

As reported by

Byron H. Kretzman, W2JTP

9620 160th Ave., Howard Beach 14, N. Y.

2-meter FSK? Could be. *Can* be! For a long time veteran RTTYers on 40 and 80 meters have taken a dim view of 2 meter AFSK operation. "Land-line," they have said. "No operating skill required; besides, distances covered are too short," others have said. Well, much of this is true. AFSK, while invaluable for training the newcomer to RTTY, is *still* no farther advanced than it was 10 years ago. But, now, how about v.h.f. itself? Progress in the past 10 years has been little short of phenomenal, both in equipment (tubes for instance) and techniques. *Forward scatter* is the technique which at present is making v.h.f. far more useful for "beyond-the-horizon" long distance communication than ever thought possible.

What has brought all *this* on? As reported elsewhere, your RTTY editor recently attended a meeting with W2NSD at the *VHF Institute*, a New York City radio club, when Sam Harris, W1FZJ and VHF Editor of *CQ*, expounded the inside dope on longhaul 2 meter operation. So what? My man, Thursday, reports that Sam took a Model 12 back with him to New England. Secondly, another very active 2 meter DX man, W2SMX, has just obtained a Model 26. *These fellows are contemplating long-haul 2 meter FSK operation!*

Seriously, with QRM conditions being what they are on 80 and 40 meters, 2 meter FSK holds the promise of reliable, day after day, *traffic nets*. Sam believes that a *three-hop* relay can be stablished to span the continent! Right *now*, normal 80 meter distances can be covered by v-h-f FSK—with a greater possibility of getting the message through, and with no static, considerably less QRM, and with tape equipment 60 word-per-minute traffic handling capability.

Yes, it will take skill, effort, and patience. We won't be able to do it with 522's. It takes high power and big antennas, as forward scatter signals are weak. But, it can be done. RTTYers *build!*

Last month the Model 26 machine was covered, with the emphasis on its electrical circuitry. This month the Model 15 is being described in a similar manner. Although much of the manufacturer's material is usually available on this machine, the coverage here is from the amateur RTTYers' point of view.

As mentioned several months ago, the Model 15 is still in current use and production. Consequently, not too many are in amateur hands. Most of those that are in use have been rebuilt from junked machines that were damaged in shipping, floods, fires, etc. A few of the military versions, the TG-7-A and the TG-7-B, have appeared on the surplus market, selling for a rather high price as compared to the Model 26.

RTTY Principles & Practice
Part 2c - Model 15

The Model 15 is a page-printer and it can be supplied with or without the keyboard necessary for transmission. Unlike the Model 26 the paper is stationary while the type bars, in a carriage, are moved from left to right as the machine prints. The keyboard is similar to that of the Model 14 and it is mounted on a heavy cast iron base, which in turn provides the base for the carriage assembly. With the proper motors and adjustment it is capable of 75-speed operation, making it compatible with the new Model 28 which can operate at 60, 75, or 100-speed. Most of the Model 15 machines that get into amateur hands, fortunately, are set up for the standard (as required by the FCC) 60-speed.

Again, it is suggested that, if at all possible, it is a good idea to obtain a Teletype table such as the XRT-97 with the machine. Outlet boxes, terminal blocks, polarized connectors,

AMATEUR RADIOTELETYPE CHANNELS

National, FSK (mark frequencies; space 850 cycles lower) 3620, 7140, 27,200, 29,160, 52,600 kc.

National, AFSK (2125 cycles mark 2975 cycles space) 27,200, 147,960 kc. calling & autostart; 144,138 kc. repeater & duplex

California, AFSK 147,850 kc. calling & autostart

Washington, D. C., AFSK 147,960 kc. calling & autostart; 147,495 kc. working

Chicago, AFSK (FM) 147,700 kc. calling & working

Detroit, AFSK (FM) 147,300 kc. calling & working

New York, AFSK 147,960 kc. calling & working

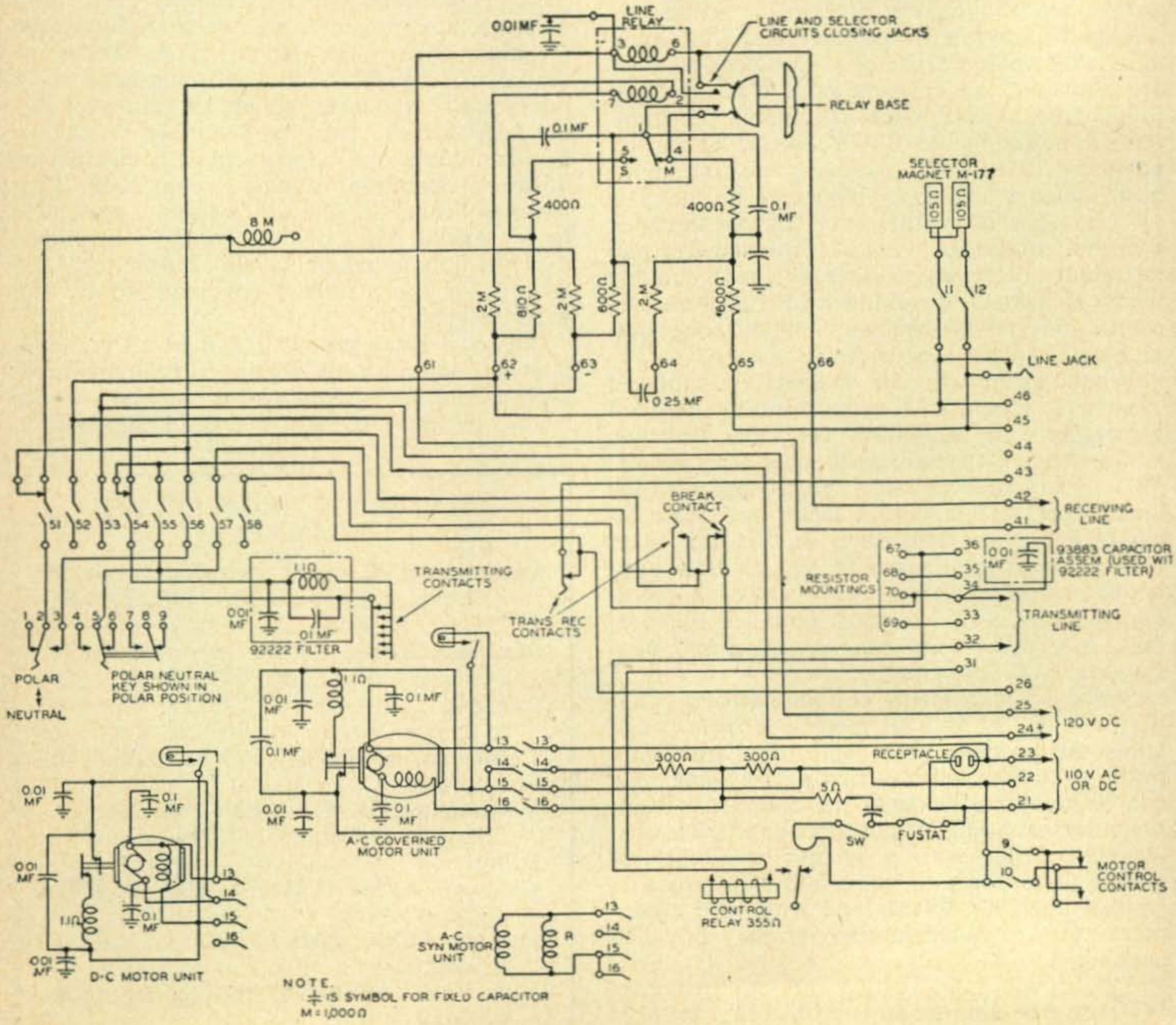
rectifier shelf, and jacks are provided. The jacks are conveniently wired to enable "local test" of the machine on a d-c loop right at the table.

Table wiring of the XRT-97 Teletype table is shown in *Fig. 3*. To help in understanding the wire line circuitry and operation, the simplified connections to the Model 15 machine and its polar relay are shown. Understanding the application to RTTY then is quite simple: The keyboard contacts are terminals *32* and *34*, or the *black* shell phone plug; and the selector magnet comes out at terminals *41* and *42*, or the *red* shell phone plug; *if* you have made the changes previously described and shown in *Fig. 2*.

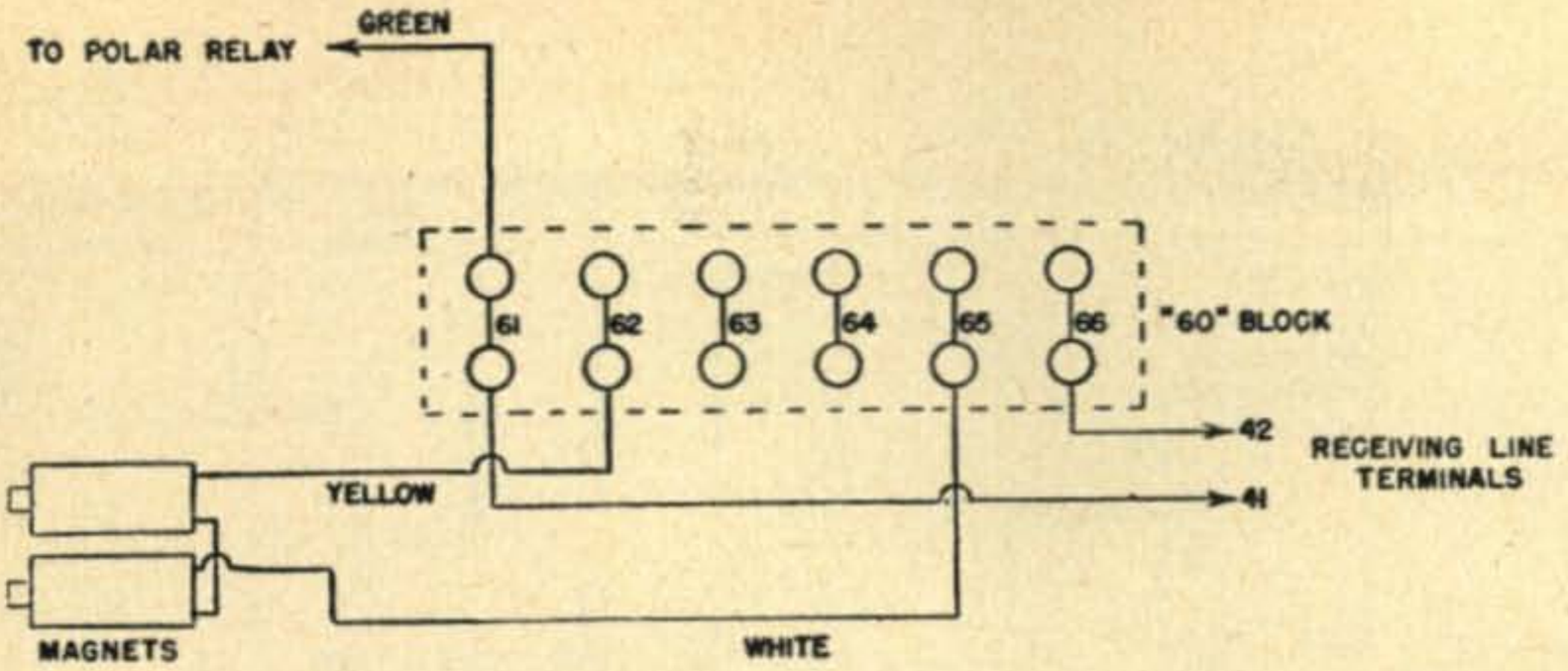
Military versions of the Model 15 are the Signal Corps TG-7-A and TG-7-B which are slightly modified versions for field use. They are mounted on a combination packing case and table for portability. (?!) The carriage assembly is removed from the base and bolted to shock mounts in a separate case. Both the TG-7-A and the TG-7-B have their selector magnets *directly* connected to the line via the cord with the red plug. This is because these machines are set up to operate with an external "line unit," BD-77-A, which has a special adjustable-bias neutral relay, volt and bias meter, and a line rheostat. The "B" version is mechanically similar to the "A" except that the following parts have been omitted: a terminal block (blocks *30* and *40* are combined), polar relay socket and circuits, polar-neutral key, and the motor control relay. Motor circuits in the "A" version are arranged for 115 volt, d.c., or 50-60 cycle a.c., or 25 cycle a.c. The "B" version can also operate on 40 cycle a.c.

Motor speed adjustment of the governed motors generally found on these machines is accomplished by watching a 10-spot stroboscopic target attached to the motor governor through a tuning fork calibrated for 87.6 cycles. The tuning fork is *Teletype* No. 72634 or No. 103628. (Signal Corps stock numbers are 6Q40001 or 4T103628)

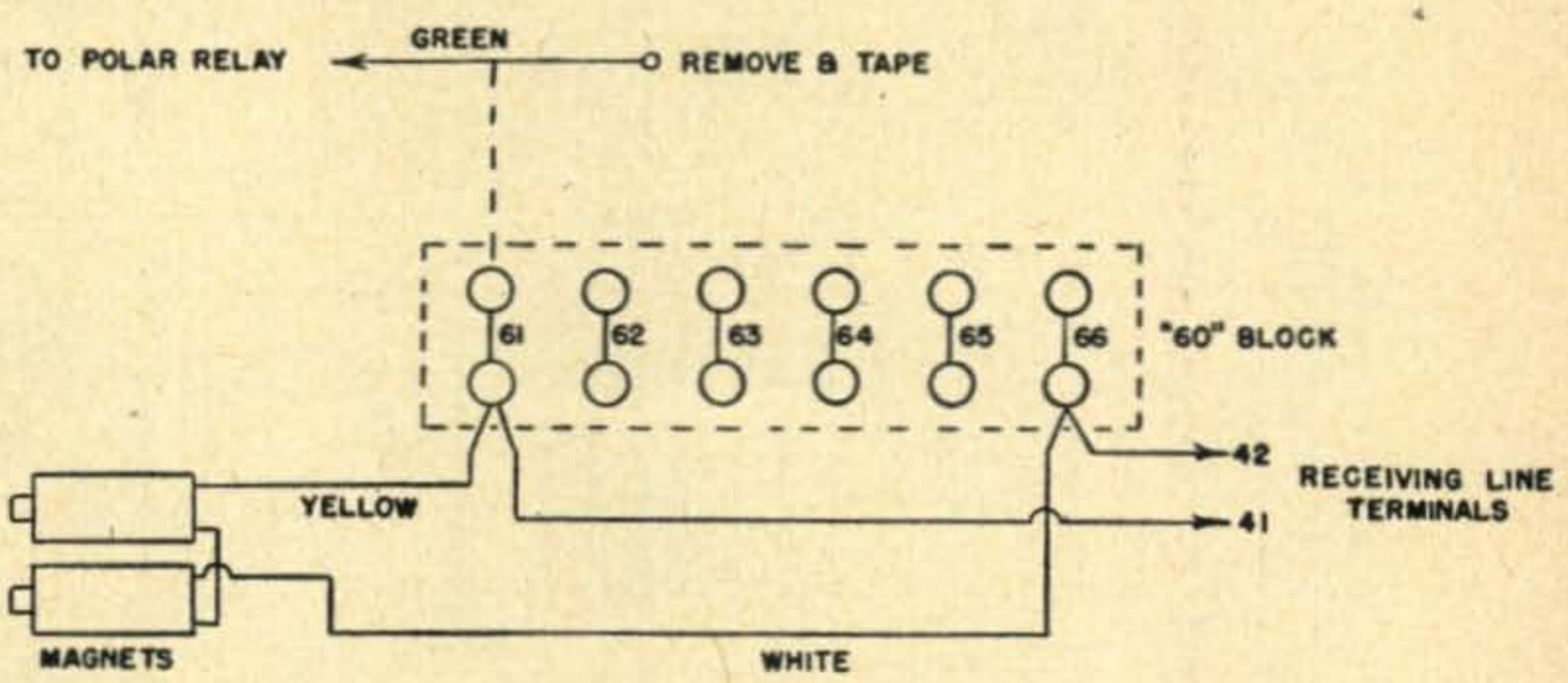
Unshift-on-space is an undesirable feature for



Model 15, Circuit Diagram.



ORIGINAL WIRING



NEW WIRING

Fig. 2. Changes for Direct Selector Magnet Operation.

RTTY operation, but it may be found in the Model 15 when obtained. This feature may be easily removed. Underneath the motor-stop mechanism is a cut-out lever. With the typing carriage removed from the base and looking from the bottom of the printer, the cut-out lever should be rotated clockwise so that the hooked end of the cut-out lever is to the rear of the space function lever extension. No more than .006 inch clearance should be between the rear surface of the space function lever extension and the cut-out lever.

Motor-stop function on upper case *H* is very often found on machines that have been in wire line service. As this feature is undesirable for ordinary RTTY operation, it may be easily eliminated by strapping terminals *9* and *10* to short out the motor control contacts. This strap is shown on the circuit diagram, *Fig. 1*.

Range-finder use on the Model 15 is a fairly simple procedure. Since only 20% of each 22 ms. code unit is actually required by the selecting mechanism, it is most desirable to set or "orient" this selecting interval in the center of each code unit. In the Model 15, the receiving unit is equipped with a mechanism called the range-finder which permits the latch assembly to be moved mechanically through an arc corresponding to the length of a code unit. The range-finder has a scale of 0 to 120 with 100 divisions equal to one 22 ms. code unit.

To find the range of a machine, it should be receiving RY's, preferably from a tape transmitter-distributor. The range-finder is moved in one direction until errors begin and then slowly moved back until no errors appear. Note the scale reading. Continue moving until the errors begin again at the other end of the scale. The two readings then give the operating margin. On a local loop circuit, assuming a perfect T-D, the margin should be 10 to 90. If the margin is found to be 40 to 105, for instance, the sending speed could be slow. A margin of 5 to 60 might indicate a fast sending speed. To set the selecting interval in the middle of the code unit for a particular set of receiving conditions, find the range as outlined above, add the two margin figures and divide by two. For example, if the range is 15 to 105, the range-finder should be set at 60. A reduced range, that is less than 100, usually indicates distortion in the signal received.

Ribbons and paper may be obtained without too much difficulty for the Model 15. Paper comes either on a roll about 5 inches in diameter or "fan-fold" in a carton. The latter type is generally found in radio broadcast stations where a radio news press service is leased. An ordinary typewriter ribbon for an *Underwood* office machine can usually be bought in a stationary store for less than one dollar and can be used "as is."

Extra features developed by the *Teletype*

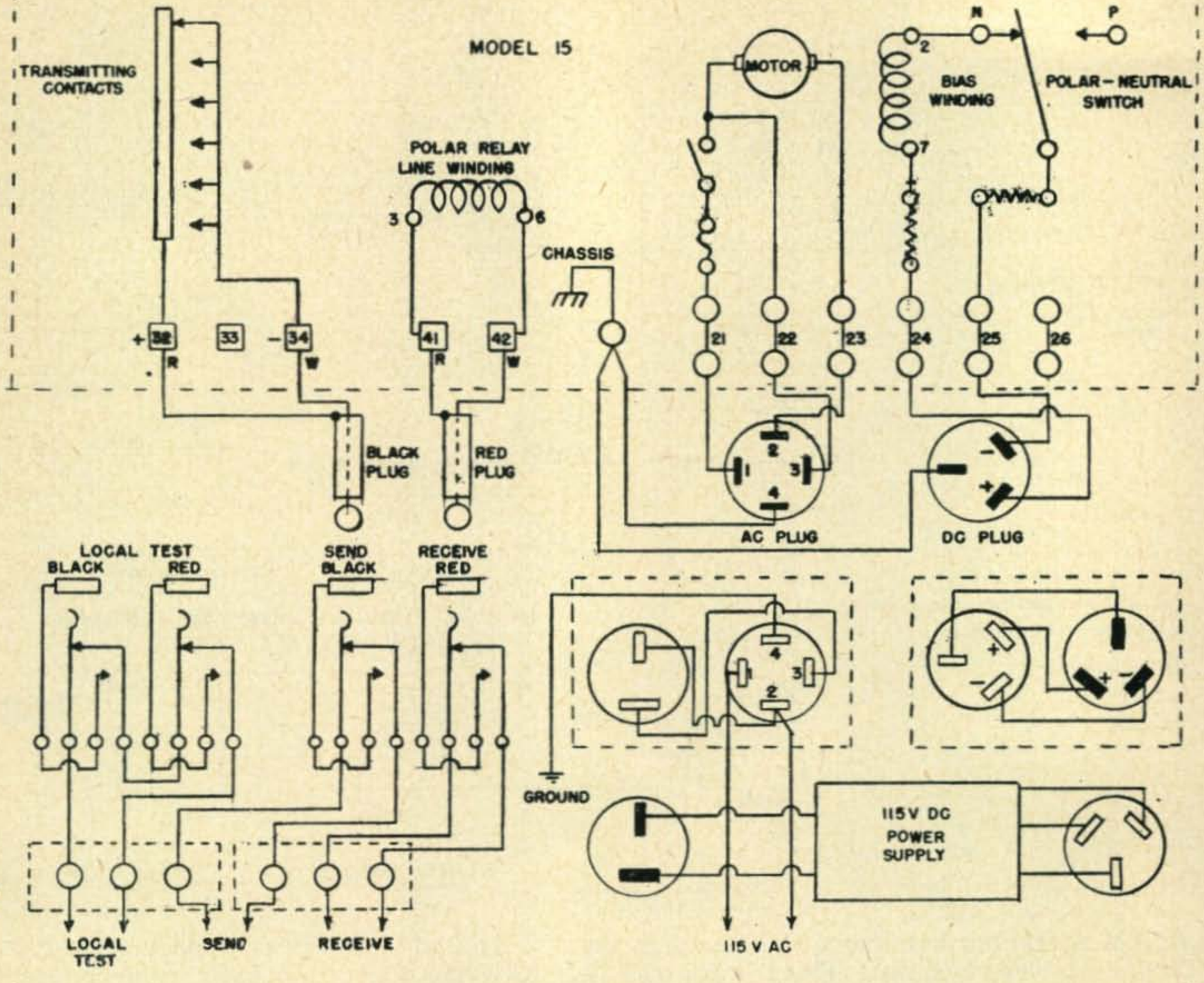


Fig. 3. **XRT Table Wiring Diagram for Model 15.**

Corporation may be added to the Model 15. Those most useful to the radioteletype operation are, the automatic carriage return (when the end of a line is reached), and the automatic line feed after the automatic carriage return. This addition should not be attempted unless you are a machine specialist. Even if you think you are a specialist, the necessary parts, instructions, and help, should be obtained through the nearest *amateur* RTTYer that specializes in machines.

Model 15, with Cover.

Circuit diagram of the commercial or civilian Model 15 is shown in *Fig. 1*. While there actually are two selector magnets like the Model 26, they are already connected in series, *but*, for 60 ma. operation. If you use this machine connected directly (without a polar relay) to the converter, the converter must be designed to provide the 60 ma. necessary.

Shown on the diagram is the "polar-neutral" key switch. This is usually absent in the military versions. The internal connections shown are those for d-c wire line use and for use with the XRT-97 table. Not shown, but brought to the "30" block are various resistors which may be connected in the transmitting line circuit. This is also a wire line feature.

For most amateur radioteletype applications it is desirable to operate the selector magnets directly from the converter. In order to do this it is necessary to disconnect the polar relay at the "60" block. *Fig. 2* shows these changes. Be careful to remove and tape the green wire entering the *top* of terminal *61*,—not the green wire entering from the bottom.

Keep in mind, too, that there is an inductance-capacitance spark filter (92222) in the transmitting circuit. Whether or not you

W9GRW, Skokie, Ill.; Operating Position.

have to disconnect this filter depends upon the method of keying used. For example, the old method of directly keying an AFSK oscillator will require that it be disconnected. Possibly some types of FSK keying circuits may also require that this filter be disconnected.

Narrow Shift

Just about the time we went to press last month, word came through that DOCKET No. 11501 became an order to amend Sections 12.107(c) and 12.107(d) of Part 12 of the FCC's Rules to permit us to use *any* shift under 900 cycles, effective March 16, 1956.

This is what we have been waiting for! Champing at the bit have been such avid RTTY experimenters as WØBP and W9TCJ. Others that have readied equipment are W3PYW, W6ZBJ, and W2JTP. Intial standardization seems to be on a short-shift of 170 cycles. (Dec. '55 *CQ*, pg 43). This eventually will be a boon to the newcomer, as simplified equipment is developed. One point should be made, however: Narrow shift will require a new order of stability—both in the receiver and in the transmitter. (This won't be new to those who have played with SSB.)

An interesting by-product of narrow shift is *autostart* on 80 meters. Bob Weitbrecht, W9TCJ, and Boyd Phelps, WØBP, have (at this writing) a 170 cycle autostart system all ready to go. It will operate on a 24-hour basis, rather than "sampling," as is the present practice on 2-meter AFSK. Continuous operation of the receiver and TU will contribute to the over-all stability of the system. Bob says that experiments with the BC-453 Q-fiver with low plate voltage greatly increases its long term stability. Of course, both transmitter and receiver will be crystal controlled. This is the "fixed frequency" approach. Another possible approach is a scanning system, over a limited frequency range, with a.f.c. Pros and cons of both systems will be welcomed.

Model 15, Cover Removed; Line Unit BD-77-A to the left.

Across the Nation

Well, it looks like W3PYW had a little competition in the recent RTY SS contest. Final results, as reported by W6AEE, place VE7KX as the winner with a score of 3968. W3PYW was next with 3744. Following Frank were W2PBG — 3402, WØBP — 3240, W2JAV — 2475, W6MTJ—2420, W9OCV—2400, and W6OWP—2376. Things were really hopping, that week-end. Even W1AW got in on the fun.

Advance dope on the RTTY functions at the National ARRL Convention in San Francisco this July comes from W6AEE. Roger Wixson, W6FDJ, is heading up the planning at this stage. W6VPC is also on the committee. Tentative set-up will be with two RTTY stations on the air, with a complete line-up of equipment from the Model 12 to the Model 28.

W2TAM, in West Trenton, N. J., is looking for a printer. Ray was somewhat taken aback by an advertisement he saw listing a Model 12 for $125.(!) Should be a few around for much less than that, Ray.

WØQKA visited WØBP ("What a lay-out!") and WØHZR recently. Result: The Model 12 is out of the mothballs again. John says that WØOET and WØWEY have both ordered Model 26's.

W2ZKV has latched on to a couple of surplus FRA converters. *Now,* you can get on FSK, Felix! W2JTP has been using an URA-8A converter on 3620 kc. This, by the way, has provision for narrow shift. W2AWQ writes from Sulphur, Louisiana, "Not much time for hamming." John expects to be in Oregon by late April.

Bob Wright, W1RMH, of Concord, N. H., writes in to let us know that ". . . there is definitely RTTY activity in the State of New Hampshire." Bob originally had a Model 12 that belonged to W1BFT but now has his own Model 26. Active in that area on 2 meter AFSK are W1YED and W1TTU. Future plans call for FSK on 80 meters.

W4BNI in Tampa, Florida, has a Model 26 and a W2PAT converter, and has been doing quite a bit of copying on 20 meters; such as W6CG, W9TCJ, and W9OCV. Ralph's present problem is to get an exciter fed into his BC-610.

WØSV in St. Cloud, Minnesota, (another cohort of BeeP's) has rigged up a gear-type of tone standard which will be described in a future column. Bob reports 2 meter AFSK in his area consisting of WØBP, WØDFP, WØHKF, WØJHS, and WØSV— with five more expected in a few months.

W8SDZ of Swanton, Ohio, wants to be put on the list of volunteer helpers for the newcomer to RTTY. This is for the Toledo area.

Comments

Those of us who operate on 3620 kc. evenings have been increasingly troubled with a new kind of QRM on the frequency—phone! Immediate investigation, usually by long-distance telephone call, has disclosed that the source of all this QRM is from American phone stations who *thought* that they were on 160 meters! Here is what has been happening, and these are no isolated cases: Just about all of the transmitters involved have been Heath-Kit DX-100's or Vikings. Now, that is not the fault of the transmitters, but the fault of the *operators*. With the oscillator on 1810 kc. they have been resonating the final on 3620 kc., *the second harmonic!*

It is significant that not one case of this QRM has come from a home-grown transmitter. The ham who lays out and builds his own gear *knows* how it works. These days it is all too easy to buy a transmitter (or kit), buy a receiver, and even an antenna cut to the correct length. All that is needed is money. *This is hamming?* The "Old Man" is turning over in his grave!

There are plenty of fellows, though, who *do* like to lay out and build their own gear. It is these hams who find RTTY attractive. Sometimes the high-price advertisements of Teletype machines that occasionally appear scare them off. These advertisements are by profiteers. In general, prices are *lower* than ever before, *and* the availability from many sources is *better* than it has ever been. Come on in—the water is fine! ■

Rochester Samfest

Scheduled Saturday, May 19, at the Doud Legion Post in Rochester, the Western New York Hamfest boasts as principal celebrity Sam Harris, W1FZJ, VHF Editor of well-known amateur journal to spark afternoon activities of the VHF group. A trophy will be awarded to winner of the code contest, entertainment will be provided for the ladies, plus a gala banquet and prizes. U CMN?

Blue Ridge Hamfest

The Blue Ridge Amateur Radio Society of Virginia will hold its Second Annual Hamfest Sunday, May 20, 1956 at Lakeside Amusement Park, Salem, Va. Registration starts 9 a.m. Program at 11 a.m. with outstanding speakers —and special features for the ladies and children, and prizes for all. Chicken or Old Virginny Ham Dinner at 1 p.m. Advanced registration and meal ticket $2.50 adults, children $1, two bits higher at gate. Address checks or inquiries to Blue Ridge Amateur Radio Society, Inc., Chairman, W4LNX, Box 2002 Roanoke, Va.

Single Sideband Dinner

The SSB membership of the Peoria Area Amateur Radio Club is sponsoring a **Single Sideband Dinner** at 7 p.m. CDST on June 2, 1956 in Peoria, Illinois. Notice of the exact location will accompany ticket mailings. Plans call for steak dinner, refreshments and dancing. Worthwhile prizes for OMs and XYL's. Tickets $5 per person in advance, may be had by writing Chairman **Jim Buzzard, W9YYM, 803 So. Adams St., Peoria, Ill.** or from any of the Peoria Area SSB gang. All AM, CW or RTTY ops are welcome but attend at their own risk, since it is well-known that "SSB Fever" is highly contagious. Remember, too! the big **Starved Rock Hamfest** is held on the following day, Sunday, June 3. Get your orders in early; plan to attend both affairs for the time of your life. Watch 75-meter SSB for further information.

Bremerton Hamfest

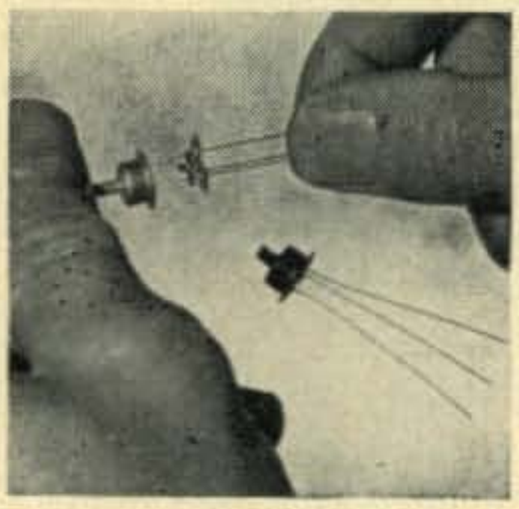
The Amateur Radio Association of Bremerton will hold their annual fabulous Hamfest May 19 at Norway Hall in Bremerton, Washington. Festivities will begin at 13:30 with mobile hunts, code competitions, display of radio gear, and entertainment for the ladies scheduled throughout the day. In the evening, there will be a banquet, special entertainment, awards of many prizes, and dancing. For further information and ticket sales contact Al, W7GUS Box 103 Port Orchard, Washington.

Mississippi Valley Hamfest

Again this year the Quad City Amateur Radio Club is sponsoring its big annual Mississippi Valley Hamfest on Sunday, May 20th, at the Rock Island County Conservation Club Grounds on Big Island, Milan, Illinois. There will be plenty of fun and bigger than ever prizes for OM, YL, XYL, and Junior Ops. Tickets are $1.25 advanced registration or $1.75 at the gate. For advanced registrations write to Ray Brunswig, W9UAE, 557 - 21st Avenue, Rock Island, Ill.

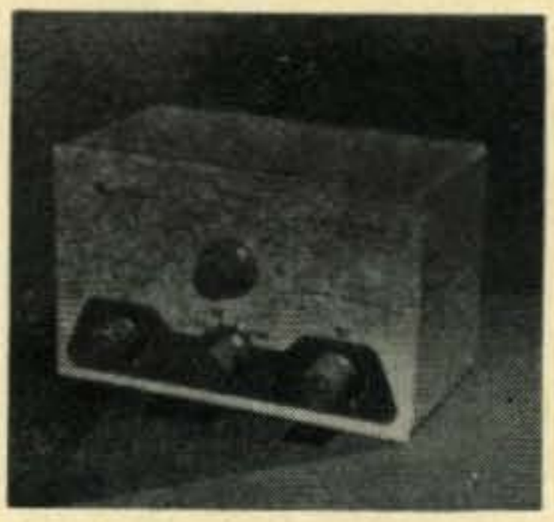
NEW PRODUCTS

Six meters, anyone? What, your receiver only tunes as high as 32 mc. Tough. Better pick up one of the new Marshall 6-meter converters! This little jiffy has a low-noise 6J6 r-f amplifier driving a 6J6 oscillator-mixer, giving balanced line input and output circuit. The i-f output is in the range of 21-25 mc. Completely wired, with a-c supply and tubes the Marshall converter is all set to put you on six meters with a bang. Come on down with the rest of the gang! Complete info on this converter may be obtained from Marshall Mfg. Co., 1406 Venice Blvd., Los Angeles 6, Calif. See you on Six!

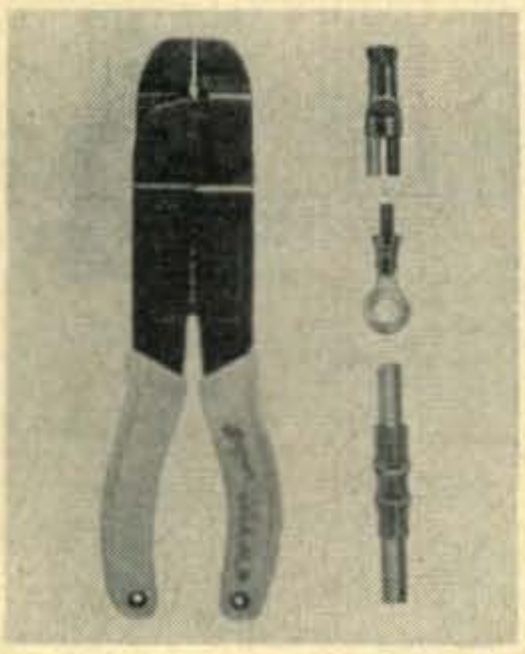


At General Electric Co., the most important product is progress! True enough. Here's the new G. E. 2N-107 transistor for radio hams and experimenters! Under two bucks, this PNP fused-junction transistor is the first of a series of units that G. E. is marketing for ham use. G.E. also puts out a snappy little booklet telling what you can do with the 2N107. Both the book and the transistor are available at authorized G. E. distributors. Here's your chance to have the jump on Dick Tracy and his wrist radio!

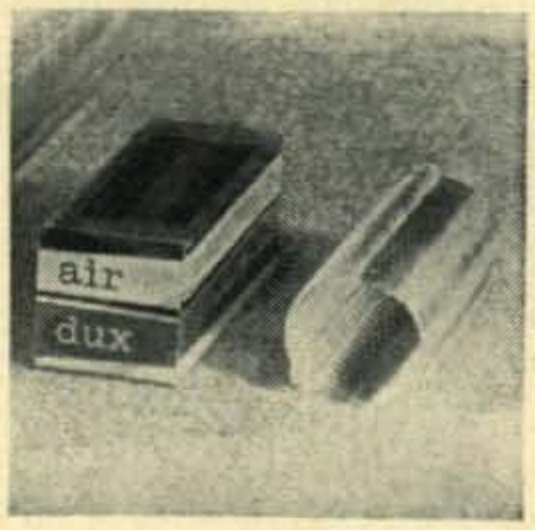
This is fascinating! Shown in the photo are two high voltage batteries. These inch-high gadgets supply 17,000 volts, believe it or not! This ATBEE converts nuclear energy directly into electricity through a special, solid dielectric, and can be used for Geiger counters, electrostatic generators, scintillation counters and ionization counters. The half-life is 25 years. Maximum current drain is one millimicroampere. Who says that there is nothing new under the sun? These high voltage batteries are manufactured by the Radiation Research Corp., of 140 East 59th Street, New York, N. Y. You can't say these boys aren't in the forefront of the march of progress!



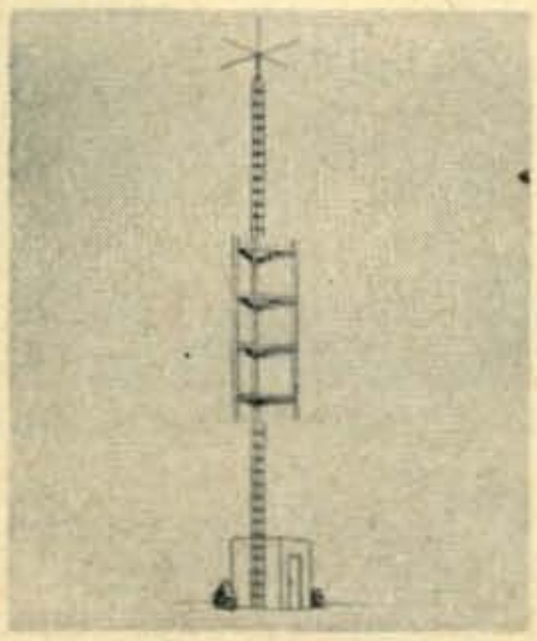
QRM troubles? Here is the new Heathkit Q-multiplier. Use it to peak the desired signal, or to null the undesired signal, or as a paper weight. The Q-multiplier works with any receiver (not ac-dc) having a 450-460 kc i-f. It's really a dilly, and any ham who has used a Q-multiplier will vouch for the effectivity of this new signal-slicer. A valuable addition to the receiving equipment in your ham shack. For further information write Heath Co., Benton Harbor, Mich.



The aircraft industry has converted almost 100% from the old, messy solder-type lugs to the new, neat pressure-type connectors. Smart radio amateurs are also using the new lugs, which securely grasp the wire by a pressure joint, formed by a special pair of pliers, shown herewith. The Super Champ Tool does away with friction tape, flux, solder, soldering iron and all that type of junk. Place the lug on the wire, make with the Super Champ Tool, and you have a real high-class joint (electrical joint, that is). With very little urging, the American Pamcor Co., 181 Hillcrest Ave., Havertown, Pa., will part with one of these Tools for a modest pittance. Write 'em, and start to LIVE!



Air-Dux! You will hear more of that name in the near future! What are they? Why, they are super-low loss air-wound inductors—wound on polystyrene strips, to be exact. Available in a tremendous range of sizes and inductances these up to date coils are just the ticket for that new rig you are building. They also make FB low-loss antenna loading coils! Try 'em! Air-dux are made by Illumitronic Engineering Co., of Sunnyvale, Calif. Yes, they will send you a catalog and full information for the asking!



UP! and a-a-way! If you feel that you aren't getting out as well as you might, may we suggest the Rohn #40 tower, available in heights up to 300 feet. This hot-dipped baby has 18-inch legs and comes in 10-foot sections. A sixty foot tower can be installed by two men! Best of all, the tower is self-supporting up to sixty-six feet. If you were trampled in the rush in the last DX contest, a Rohn Tower will transform you from the under-dog to the top-dog! Full information on the #40 Heavy-duty tower may be obtained from Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill.

Last call! The "Single Sideband Application Bulletin" is still available from Eimac - McCullough, Inc., San Bruno, California. This 24-page book gives SSB ratings for Eimac tubes and discusses other technical topics in this increasingly popular field. Some of the circuit designs in this handy book will make your eyes run out on stalks! Look especially on page 7 at the new Eimac experimental X-593 tetrode. Isn't that a beauty! This book is a must for all amateurs. The book is free—gamble a stamp and get hep!

DX

Gathered and reported by

R. C. "Dick" Spenceley, KV4AA
Box 403, St. Thomas, Virgin Islands

Our heartiest congratulations go to the following stations upon their achievement of WAZ:

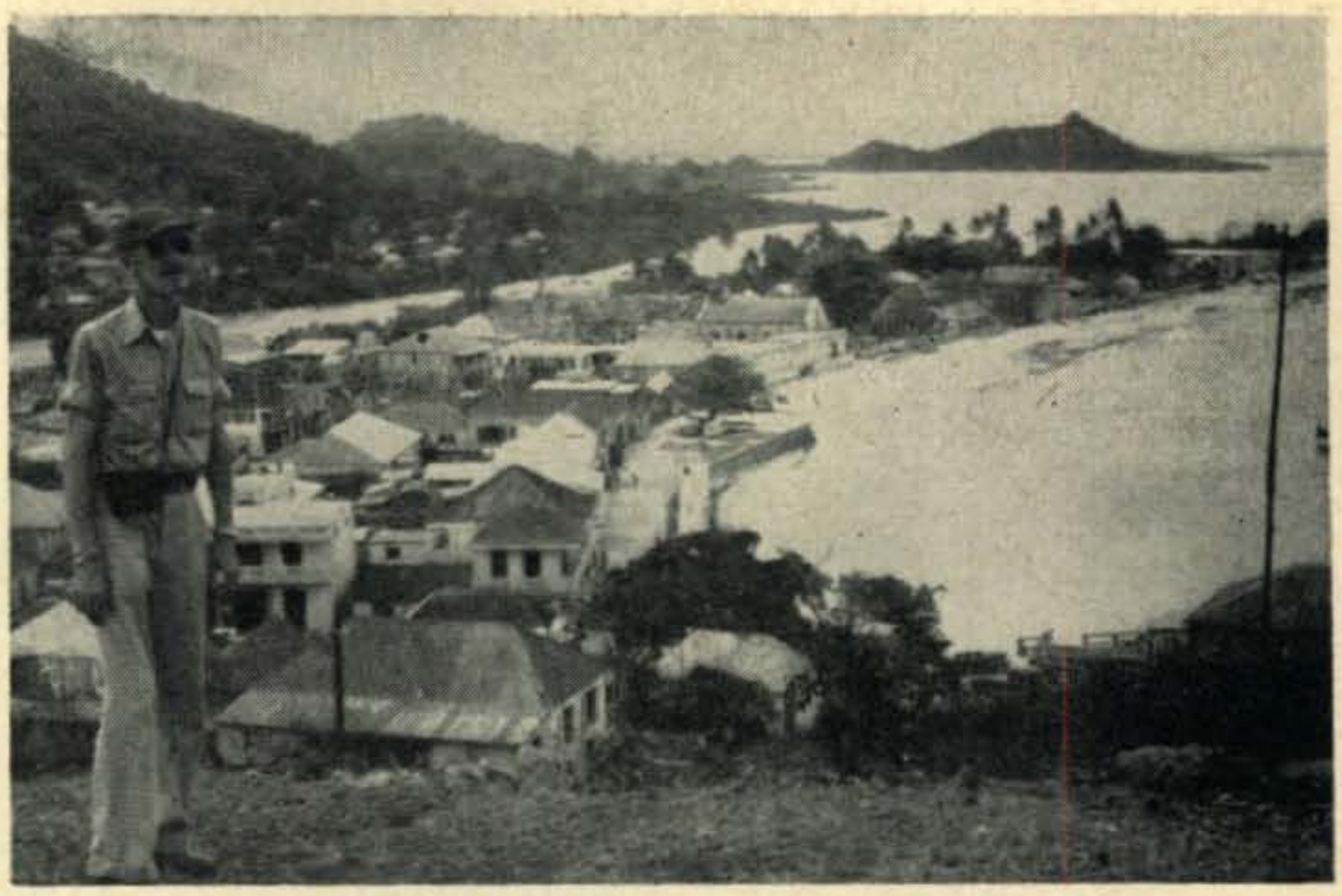
No. 317 CLINTON W. FLOWERS
W8SYC 40-234 (10th W8)
No. 318 NORMAN O. MERZ
W9YNB 40-182 (8th W9)
No. 319 DALLAS W. WULF
W9FID 40-241 (9th W9)

We also welcome the following newcomers to the HONOR ROLL:

W2GT	39-227
DL4ZC	39-179
W8AE	38-145
K6ENX	36-145
W1ODW	35-158
K6ENL	35-108

FRENCH ST. MARTIN, FS7RT (North California DX'er): When Reg Tibbetts, FS7RT (W6ITH) arrived home in Moraga a day or so ago, he was greeted by a tremendous mount of mail, the aftermath of two weeks of extensive hamming at French St. Martin Island in the Caribbean. You will recall that we were wondering, after Reg said that prospects of this trip were remote indeed, how he was able to show up at FS7RT six days later. Well, it seems that Reg had been doing a lot of negotiating with the French Government at Paris. At the date of the last Club meeting, these negotiations have not proven fruitful, but on the Monday following, a cable from Paris bore the official approval to operate at St. Martin. Reg had most of the gear ready to travel due to the fact that he had recently returned from a jaunt to Hawaii with it. So, after a bit of hurried dickering with United Air Lines and Pan American, the KWS1, 75A4, 1.5 KW putt-putt and Reg were loaded aboard a DC7 and headed for New York and from there to St. Martin (Via KP4). It can be seen that no time was lost because the following Wednesday, February 15th, Reg was sending out the first CQ from FS7RT. He says you can read all you want about the thrills others have experienced as a result of a CQ from some rare DX spot but actually having it happen to you personally is all but beyond description. Reg is of the opinion that it pays to go to all the trouble of obtaining official permission from the Central Government of the country in which you wish to operate. This opinion paid off in this case because shortly after he fired up he was paid a visit by a substantial segment of the local Gendarmerie, equipped for action and in a mood for finding out just what was going on and why (Reg had not thought it necessary to check with the Police upon his arrival). The official paper from Paris answered all the questions and, from there on, all was cheek kissing and champagne - - -. W6ITH is primarily a phone man, but he knew that by passing up CW a substantial segment of the DX fraternity would be denied a new country so at FS7RT both phone and CW were worked, all bands, 80 through 10. Since Reg has just returned home and has not had the time to check everything real closely, the following facts and figures are subject to slight variations. He worked 3012 stations, about 1000 being on CW and the balance on phone. Phone was mostly SSB. Since common courtesy dictates it, an attempt was made to work all the French and French possessions possible, and a substantial number were QSO's including, F, FL8, FD, FR7, CN8, FO8, FA, etc. Besides giving thousands of W's a new one, a lot of first class DX was worked, including such stuff as CR8, MP4B-, MP4K-, MP4T-, VU5, UC, UF, UA, UH, UP, UQ, UR, ZA, ZD1, SU, ZD3, SV (Crete), OD, SV (Rhodes), ZB1, ZB2, etc. etc. All in all, DXCC both phone and CW were easily made during the short stay at FS7RT. From the instant the first CQ went out, it was like being in the middle of a huge beehive and it stayed like this the entire time. During the course of a single day's operation over 200 Europeans and Asians were worked plus the usual quantity of W's. Reg is finding some interesting things in the huge stack

Doc, FS7AA (W2BBK, FP8AK), with rig.



View of Marigot, French St. Martin, from "Fort" Hill. Sightseer is Ed Vickers, ex-W9/WIVI, a broadcast engineer.

of mail which was awaiting him on his return home. There were direct airmail QSL's from countries behind the Iron Curtain, and long overdue QLS's for W6ITH QSO's with DX who are now after the FS7RT QSL. Reg says there need be no concern about getting QSL's because he fully intends to QSL to all, card for card, for every contact on every band both phone and CW. Reg is to be highly commended for having done an excellent job in giving us all a rare country. He gave both phone and CW an even break and even went so far as to attempt to contact a few novices on 21 Mcs. but with not much success. Thanks, Reg, from all of us for an outstanding example of DX'peditioning! The QSL's of FS7RT, now being made, will be reproductions in full color of an oil painting of a typical St. Martin scene by W6ITH's XYL, Louise.

DJ2LK, Egon Bock, Rendsburg, Germany runs 150 watts 3.5 through 28 Mcs. View of beam shows that repairs present no problems.

FRENCH ST. MARTIN, FS7AA: Doc Evans, W2BBK, reached St. Martin on February 24th missing FS7RT by about an hour. In rather interesting contrast to Reg's well equipped trip Doc arrived with absolutely NO gear. With his FP8AK ticket and with the kind cooperation of "Mayor" Fleming and Chef des Gendarmes 'Capitaine' Cambon he was given permission to go on the air as FS7AA. Then came the problem of obtaining ham radio gear. Not wishing to detract from Doc's story, which should appear in *CQ* shortly, we will only say that this seemingly impossible chore was successfully accomplished and FS7AA appeared on the air in the late afternoon of February 25th (ARRL contest) and took over the 14 Mc band. 160 contest contacts were made and followed by 201 more over the next two days which gave FS7AA a 361 total. Many more could have been made but for the erratic behavior of his receiver. Leaving St. Martin W2BBK repeated his FP8AK/VP2 operation of last year on the British Virgin Island of Tortola. Two days operating from this QTH produced 322 contacts as follows: 14 CW 242 QSO's, 14 phone 69 QSO's, 3.5 CW 10 QSO's. One contact was made on 160 meters with W2QHH which is probably the first W/Leeward Island top band QSO!

COMORO ISLANDS, FB8BR/FB: Between February 23rd and March 1st Hubert, FB8BR, was the first ham station to operate from this rare spot and was instrumental in giving many a new country. To those who missed out (including W1FH

and KV4AA) there will be other chances as Hubert expects to spend a day or so each month in the Comoros. His second trip was due on the first or second Friday of April for two days. We expect to have a story from him shortly.

AVES ISLAND (Caribbean), YVØ: Luis, YV5BZ, Secretary of the Radio Club Venezolano, has informed us that considerable thought has been given to a DX'pedition to Aves Island and Government authorities have been consulted. While no definite results have yet been obtained there is a possibility that such an expedition could take place during the first week of July which coincides with "Nation's week" commemorating the anniversary of Venezuelan Independence. An offer has been made by Bill, KV4BB, to furnish such an expedition with such equipment as a KWS-1, 32-V-3, 75-A-4, 75-A-3, Gas generator and antenna should he be allowed to accompany them and do some operating.

YASME EXPEDITION, VP2VB/P: By this time Danny should be safely on Canton Island and, we hope, going-to-town with a VR1 call. He set sail for Canton on March 7th, after winding up affairs at FO8AN, and the luck he usually encounters at the start of each voyage showed up again in the form of a dead calm for the first six days. Thus the YASME's engine had to be operated continuously eating up his gas supply at the rate of ten gallons per day. Operating of the engine was a "must" otherwise the prevailing currents would have swept him far to the southwest. After six days of this a strong breeze sprang up which has continued to this writing (March 16) and which has enabled him to log very satisfactory runs of over 100 miles per day. Should the wind continue to be generous arrival at Canton was due about March 25th. Danny's course is set in a northerly arc which would allow him to stop at the PENRHYN ISLANDS should lack of wind and low gas supply cause an emergency. This spot, due to its

Last Minute Items

The "YASME" arrived at Canton Island (British Phoenix Group) at 1400 GMT, March 26th. He was immediately assigned the call letters "VR1B." After an initial QSO with KV4AA, 0230 GMT, March 27th, Danny caught up with some four days loss of sleep and appeared again at 0230 GMT, March 28th, and got down to business. From the resulting pile-ups it appears that he will be doing a land-office business during his stay of a month or two. QSL's go via KV4AA and must be accompanied by a dollar for prompt reply via airmail as explained in an earlier column. . . . Another newcomer of exotic nature is SVØWN on Crete who appeared with a very strong signal near 14003 kc, 0200 GMT. He is Alan J. McCormack (W1TYW) and advises that QSL should go to him via General Delivery, Iraklion, Crete. We don't know the length of his stay but it seems to be semi-permanent. It is also expected that he will be active on phone. . . . Yet another nice one is VQ1EQ, Zanzibar, he has been holding forth on 14025 kc. His name is John and his stay may also be of a semi-permanent nature. . . . The projected YVØ DX' pedition to Aves Island seems to be a definite possibility now and that spot should be represented by three or more YVØ prefixes from July 1st to 8th. Simultaneous operation on two, or more, bands is planned. Aves Island is only 1500 feet long and from 120 to 360 feet wide. The highest point is only ten feet and the whole island is gradually being washed away by seas which overrun it in stormy weather. Thus, this trek is most timely! . . . Via F9RS we learn that the Norwegian prefix "LB" has been suspended since October 1955. The following prefixes are now in effect: LA/M, portable on ships. LA/G, Norwegian possessions in Antarctica. LA/P, Spitzbergen, Hopen Island, Jan Mayen etc. LA/ with other letters are portables in the different departments of Norway. . . . It is reported that VQ5GC will visit OQØ and perhaps VQ9. Another VQ9 possibility is G2RO signing VQ9RO . . . . HI8FR is giving many an HI contact. We have his QTH as: Martinez, 8 Estacion de la Feria de la Paz, Ciudad Trujillo, Dominican Republic (Near 14090) . . . . VQ6LQ welcomed Bob, VQ6RO, in Somaliland as it gave him a new country!! . . .VK1GA is active from Mawson, Antarctica . . . . KR6QC says: Avoid KR6CA, HC, HM, HN, IG, IN, LP, OH and ZC, they are nix gut! . . . Commemorating the 25th Anniversary of THE FRANKFORD RADIO CLUB, this club makes the "WFRC" (Worked Frankford Radio Club) Certificate available to all licensed hams. This handsome, three-color, award will be presented to any ham giving proof of contacts with club members, since January 1st, 1946, as follows:

a. Frankford Radio Club Member – –50 Contacts.
b. U.S.A. and Canada – –25 Contacts.
c. U.S. Possessions – –15 Contacts.
d. Foreign – –15 Contacts.

Stickers are available for 25, 50, 75 and 100 contacts. Mobile, Portable or /MM stations may also obtain this award if the contacts were all made from one state, country, ship, etc. Send your *LIST* of contacts, along with your own QSL card to "Awards Mgr., Frankford Radio Club, P.O. Box 400, Bala-Cynwyd, Penna." No enclosed postage is required. FRC members number 119. . . . ZL2LB advises that the ZL Bureau is Box 489, Wellington, N.Z. and NOT Box 9138 Auckland.

73, Dick KV4AA

remoteness, should qualify for a "separate" one with a possible ZM8 prefix! Good news comes from ZL1TZ, Les Wright, who is stationed at the radio station on NAURU, that Danny has been assigned the call "VK9TW" for Nauru. This was apparently obtained through the efforts of VK2DI to whom we are much obliged. ZL1TZ/Nauru also plans ham activity but, before doing so, is endeavoring to obtain a prefix, other than VK9, which would give Nauru the individuality its location deserves. Whatever the prefix however, we believe that Nauru's position as a Trust Territory, jointly under G, VK and ZL, will leave no doubt as to its separate status. Through the generosity of Art Collins, WØCXX, and Collins Radio we are pleased to state that a 75-A-4 receiver now awaits Danny at Canton Island. Also, from W7FA, he will have a three element beam, also adjustable for 21 Mcs., on 14. This will aid, no end, the expeditions' inhaling and exhaling.

TROMELIN ISLAND, FB8BK: This QTH now qualifies as a SEPARATE COUNTRY for WAZ listings. Activity is expected from there by FB8BK and other stations.

Dx Notes

G2RO rides again! A letter from Bob states that he was due to be on from Aden, VS9RO, and British Somaliland, VQ6RO, between March 17th and 31st. Most of the time will be spent in Aden. He ran the usual 15 watter and frequencies were 7030 or 14060 . . . CR8SA is reported to be in Goa QRP with phone. CT1JS says that CR8AG and CR8AL are now at the Goa Airport but we have heard nothing from them via VK and 4S7 reports as yet . . . Frank, YJ1AA, and YJ1RF have been active in 14 CW . . . We hear that Adrian, FW8AB (Wallis Island), is most active around 0600 GMT Sundays on 14040 . . . FO8AL is active from Tubul Island some 500 miles south of Tahiti . . . AC5PN knows nothing about AC4TN who was active on 14052 recently . . . W4IKC/KW6, ex-KW6AR, is on Wake Island for a year's stay. See QTH's . . . SVØWL, who returns stateside in June, reports there are about ten SV1 license holders on the air. There is no one on Crete. SVØWE is very active from Rhodes on A3 and SVØWU (Rhodes) will be on shortly when rig is repaired . . . On March 14th MP4QAL went QRT from a Qatar QTH and QSY's to Doha, Qatar. He hopes to get on again by March 24th. See QTH's . . . XZ2OM (Burma) advises that he is swamped with QSL's but promises to answer each and everyone received . . . W4ERJ says that UC2AA may be heard and worked around 0800 GMT on 14070 . . . W2MUM heard FU8AJ on 14063 at 0300 GMT . . . LA6U advises that LA9LD/P (Spitzbergen) is on, with QRP, 3520 kc, 0700/0800 GMT . . . W5FXN reports VU5BC, 21090, 2300 GMT, QSL via VU2AX or VU Bureau . . . VP7NG leaves for KP4-land shortly . . . Stan, VP5SC, is now on Ascension Island and should be on by this time with a ZD8 call . . . KP4WN will soon be KV4BQ in St. Croix V. I. . . . KP4TF QSY's to Elizabeth City, N.C. where he will probably be heard with his old call W4JPY . . . Rumors have it that VQ4AQ goes to VQ9. No dates . . . KT1UX/KT1EXO advise that the IFNI trip is off until Fall . . . Via W6YY we hear that February 19th was a red letter day in South Cal. with several W6's working WAC with the first good 28 Mc. opening . . . The North Cal. DX'er advises that W6MHB and W6HNX left for Florida and Caribbean assignments on February 24th. Wherever they wind up they will be on with Viking Rangers and 75-A-4's . . . W7FNK/-FO8AI plans another South Pacific this Summer and may get to ZM7 or Nauru . . . We print the following (for what it's worth) as reported by PY6FI. He advises that LU1ZM was due to be on the air from Nepal on March 21st at 1900 GMT, 14350, phone only! . . . W3MDO reports that Chris Rosetti, W3YFB, may be transferred to Viet-Nam and may supply some activity there if ban is lifted . . . AP2RH is active on 14025 kc . . . FY7YE, Mario, offers to visit French and

160 Meter DX'ers Shelly Cleaver, W3RGQ, (left) and Ted French, W3FBV, were snapped by W1BB during a recent visit to Shelly's Nescopeck, Pa., QTH.

Dutch St. Martin if ham gear can be provided. He will stand all other expenses. HOW ABOUT IT? Possibly he can get-together with PJ2AA on this. Dutch operation would be dependent on license permit.

"PHONE ONLY" LISTINGS IN THE WAZ HONOR ROLL SHOULD CONSIST OF PHONE-TO-PHONE CONTACTS *ONLY!*

Addresses

AP2C	c/o Cannaught Lines, Quetta, Pakistan.
CN2AY	Box 57, Tangier.
CR6CV	Box 3078, Luanda, Angola.
DL7AH	Harry Lilienthal, Airport, Munich 64, Germany. (Send IRC for direct QSL)
EA8BO	(New) Box 215, Tenerife, Canary Islands.
EL2C	Box 36, Harbel, Liberia.
F9QV	(New) Raoul Novalees, 7 Parc Mont Plaisir, Bonifacio, Corsica.

FM7WP ..... (New) Francois Leandre, Petit Paradisa Plata, Fofo, Martinique, F.W.I.
FS7AA ..... Via W2BBK.
FS7RT ..... Via W6ITH.
HH5GR ..... Via HH3DL.
LU9KL ..... Escuela Industrial, Av. General Paz 920, Tusuman, Argentina.
MP4QAL ..... Fergus Walshe, c/o Shell Oil Co. of Qatar, Box 47, Doha, Qatar.
OD5BS ..... Via American Embassy, Belrut, Lebanon. (George)
OQ5BT ..... Box 4232, Elisabethville, Belgian Congo.
OQ5HI ..... Box 634, Elisabethville, Belgian Congo.
PY7QU ..... Box 251, Natal, Brazil.
SU1CN ..... Via RSGB.
UA6UI ..... Box 22, Astrakhan, USSR.
VP5RR ..... (Turks Island) via W5HVV.
VQ2SB ..... Mufulira, Northern Rhodesia.
VQ5GC ..... Neville Jackson, Box 23, Entebbe, Uganda.
VU2NR ..... Box 534, New Delhi, India.
W1RAN/DL4 ..... Edward Raub Jr. HQ Co. 34th Sig, Bn. APO 107, PM., N.Y.
W4IKC/KW6 ..... (ex-KW6AR) Ivan Lundblom, C.A.A. Wake Island.
ZD1DR ..... Dave Roberts, Box 66, Freetown, Sierra Leone.
ZD6RM ..... Box 472, Blantyre, Nyasaland.
ZS3BB ..... Box 358, Windhoek, Southwest Africa.
ZS4IF ..... Frederick Van Niekerk, 104 Transvaal Road, Kimberley, South Africa.
4S7GE ..... Box 985, Colombo, Ceylon.
5A2TG ..... Fran (YL), Box 372, Tripoli, Libya.

Thanks to North Calif. DX'er, W8OPG, W8YIN, SWL Tommy Ashley, W6YY, W8PQQ, W8GLK, DL4ZC, G4CP, W1ODW, K2JWM and W5CFG.

DX'ploits

Andy, W6ENV, leads off this month with a 263 total thanks to FS7RT and FB8BR/BR . . . The same two gave Don, W6AM, a modest 262 while Paul, W9NDA, comes up to date with 11 additions which include such as YA1AM, FD4BD, AC5PN, LU3ZY, XW8AB, FS7RT and FB8BR/FB to rest on 261 . . . Frank, W6SYG, rises to 260, as does Frank, W6AOA, with FS7RT and FB8BR/FB. These same two pushed Walt, W6SYG, to 259, and Al, W8PQQ, to 258 . . . Bob, W3GHD, nabbed AC5PN and FS7RT to hit 257 while Howie, W2AGW, rose to 256 with FB8BR/FB and FS7RT . . . The same stations nudged Bill, W6SN, to 255 along with Glenn, W8KIA . . . Jim, G6ZO, upped to 254 with FS7RT, PJ2MA and FB8BR/FB while Jim, W8JIN, jumped to 253 with such as YA1AM, LU3ZY, FS7RT and FB8BR/FB . . . Glen, W6ADP, moved to 252 with ZS2MI, YA1AM and FS7RT as Ozzie, W9VND, made it 249 with FB8BK (Tromelin Is.) and FB8BR/FB . . . Oscar, W3JNN, reached 249 with FB8BR/FB and FS7RT as Gene, W6EBG, nailed the same two for a 247 total . . . Dewey, W6VE, upped to 246 thanks to VQ5GC, FS7RT and ZD3A while Dallas, W9FID, secured WAZ No. 319 and HI8FR for 241 . . . W1GKK, went to 236 with YA1AM, LU3ZY and FS7RT as Horace, W6TI, keyed with FS7RT, ZD3A and FB8BR/FB for a 235 total . . . Clint, W8SYC, was awarded WAZ No. 317 and went on to add ZD3A and FS7AA to reach 234 . . . Ray, W6BUD, adds 9 which include a '47 QSO with MX2AG for 234 while John, W6EFM, hit 231 thanks to VP8BK, LU3ZY and FS7RT . . . Lee, W7HXG, added VP8BK, LU3ZY, FS7RT and FB8BR/FB to reach 227 as Jack, W6NTR, goes to 224 with LU3ZY, FS7RT, VR6AC, AP2RH, FB8BR/FB and ZD1DR . . . Don, W6LRU, was right in there grabbing FS7RT and FB8BR/FB for 209 while Burt, W6EHV, upped to 209 with FS7RT, VQ5GC and VR3B . . . Wally, W7ENW, picked up LU3ZY, VQ6LQ, PZ1LL, OD5AV, VS4NW and FS7RT to hit 202 as Don, W6BVM, reached 196 thanks to EA6AF, VP2DI, ZS7D, VR3B, FS7RT and VS9AS.

A QSL from AC4RF gave Norm, W9YNB, WAZ No. 318 as Vip, W6ID went to 177 with FS7RT . . . Leading in the 39 zone list by a comfortable margin is Bill, W5ASG, who reaches 256 with FS7RT and FB8BR/FB while Stan, W1CLX, ups to 245 with FS7RT . . . Weldon, W2NSZ, goes to 240 with FS7RT as Van, W9HUZ, rises to 326 with FS7RT and FB8BR/FB . . . Joe, W8UAS, rests on 231 thanks to FS7RT, FB8BR/-FB and YJ1DL while Roger, W1JYH, snagged FS7RT, MP4QAL and 3A2BH for a 227 total . . . George, W2HZY, was also among the many QSO'ing FS7RT and FB8BR/FB which gave him 225 as Bob, W4GG, ups to 226 with such as VR3B, ZD3A, KJ6BG, XW8AB, FK8AH and LU3ZY . . . Before moving to new QTH Ev, KP4KD, rose to 212 with XW8AB and FS7RT while Carl, W9ABA, keyed with ZC5CT, FB8BR, VP8BK, FB8ZZ, LU3ZY and FS7RT to hit 210 . . . Bob, W2EMW, makes it 207 with such as 3A2BH, ZD6RM, ET3LF, VQ5GC and FS7AA as Clif, WØAZT, comes up to date with 15 additions putting him on 206 . . . Buck, W4RBQ, is heard from again as he adds FS7RT for No. 206 while Bob, W1KFV, goes to 204 with FB8ZZ, FS7RT and CR4AG . . . Hal, W6TXL, ups to 194 with 3V8AN, LU3ZY, MP4QAL, ST2DB and FS7RT as Lee, VK3XO, hits 183 thanks to CR6AI and TF5TP . . . Paul, K2GFQ, goes to 181 with LB8YB, VP8BK, VS9AS, YJ1DL, CR4AG, TG9MR and FS7RT while Gus, W2HMJ, adds ZD1DR, ZA1KAD, ZS7D and FS7RT for 225.

Jim, W5FXN, adds UA9VA (Taiga, Zone 18) for a new zone as Jim, W9LI, pushes to 177 with LU3ZY, ZB2I, HI8HG and VS6AE . . . Fred, W8KML, nabbed FS7RT and FB8BR/BR for 197 while Dixie, W2ZVS, makes it 181 with FS7RT . . . Harry, WØANF, nabbed FB8ZZ for No. 178 as Steve, W2HSZ, ups to 173 with CR9AI . . . Bob, K2GMO, keyed with KB6BA, CR5JB and FS7RT to reach 171 while Aleta, K6ENL, makes an appearance on the Honor Roll with 108 . . . Guy, W6DI, miked with FS7RT for a phone total of 217 as Don, W6AM, A3'd

to 195 with FS7RT . . . Paul, W9NDA, adds 14 new phone contacts to reach 224 while Ernie, W6KQY, went to 198, phone only, with LU2ZY, EA8AI, CT3AN and FS7RT . . . Oscar, W3JNN, went to 215 on phone with FS7RT as Bob, W3-GHD, embellished his A3 total with 4S7GE and FS7RT for 196 . . . FS7RT put Fred, W8KML, on 195, phone, as Willard, W1NWO, reached down on 28 Mcs. for CR5AC for 212 on phone . . . Bill, W5ASG, miked with ZK1BL and FS7RT to hit 190 as another Bill, W4ESP, went to 166 on A3 with such as EA9AZ, ZD6RM and FS7RT . . . Lee, W7HXG, phoned with ST2DB, CR7AH, FB8ZZ, LU2ZY and FS7RT for a 142 total . . . First W QSO for YJ1RF was with W6CUQ on xtl 14150 . . . KP4TF maintained a four year, weekend, sked with W4NRN with only 5 misses . . . John, W6YY, was the recipient of the South California "DXER AWARD" for 1955. This award is for outstanding DX performance among South Cal. DX amateurs . . . Ed, OH2RY, finally hooked VP5DC for No. 226 . . . Chas, KV4BK (ex-W5RX), has now reached 106 with 80 QSL's to show for it . . . George, W3AS, ups to 162 with such as VQ5GC, FS7RT, ST2NG, ZA1KAD, VS6CG, KX6AF, VP8BK and ZD2JHP . . . FB8-BR/FB was No. 204 for VK3CX . . . W8JGU went to 182 with FS7RT . . . Gene, W7VY, claims 260 with FS7RT and seeks QSL from EP1AL for '47 QSO . . . W4BYJ hits 72 with VP8BC and HB1OP/HE . . .VQ5GC gave W5WZQ his No. 148 while K4GSS (W8FJN) makes it 72 at Ft. Benning . . . Lloyd, DL4ZC, A3'd with MP4KDS, on 14, while CW activity accounted for 4S7PT. FO8AM, VK7UW, CT3AB, VQ5GC, 3A2X (?), FB8BR/FB on 14 and FM7WD, VK9XK, KH6IK, ZS5PL and PZ1RM on 21.

Brad, KP4TF, winds up a four year stay with 140 worked in 35 zones . . . Paul, W9KXK, goes to 157 with such as ZB2I, VQ6LQ, YA1AM, LU3ZY, VU2KM, ZS9G and ZC4IP . . . Two months operation at VE3BWL has netted Ron 37 countries on 14 and 21 including such as FF8BI, CR6CH, KG1KK and PZ1BS. The rig is a Viking Adventurer . . . Ray, W9MQK, ups to 167 with LU3ZY, YA1AM, VP8BK, VQ5EK, ZD1DR, ZS7H and FS7RT (Am sure all XW8AB cards will come through in time Ray) . . . George, W9BEK, active on 21 phone, goes to 47 with ZP5AM, KR6AF, KG1KW, ZE2KR, VQ4EO, ZS9G. ZS4IA, PZ1RM, ZL1CW, VP3HAC and KC6CG . . . Ron, W2SUC, makes it 124 with such as FO8AN, VS6CG, EA9BP, LZ1KPZ, ZC4IP and YO4CR . . . Bob, WØVBS, on 7 CW, nabbed I1MQ, PJ2AC, VQ4EO, TI2VMB, VK2-WI/P, PY6FI, KJ6BN, EA3GF etc . . . Ernie, W3MDO, is up to 34-136 with XW8AB, 4S7GE, ET3LF, VS9AS, FM7WN and TG9AD . . . Jack, W8EKK, who is paralyzed and keys via voice voltage amplifier, recently nailed XW8AB for his No. 175. Congrat! . . . Warren, WØNGF, nabbed MP4QAL for his No. 100 on 14 Mc. other catches are VQ6LQ, VR3B, CR4AG, HI8FR, CR7CI and KX6AF. . . .

W5ASG, Bill Hall, of Widener, Ark., needs no introduction to the DX fraternity. Bill's CW score stands at 256 countries plus 190 On phone.

Applicants for the French DPF and DUF Certificates should apply as follows: DPF, To Lucien Aubry, F8TM, 7 Rue Marceau, Palaiseau (S & O) France. DUF, Edmond Dubois, F9IL, Aubencheul-Au-Bac par Aubigny-su-Bac (Nord) France. There is now no cost for these certificates but IRC's should be included for return of QSL's (5 IRC's will take care of the return of 20 cards by Registered mail). Holders of DUF/4 may obtain the silver mdal for 23 IRC's.

To those who are making serious attempts to latch on to stations in Zones 18, 19, etc. here are a few usable phrases which might cause your quarry to break down and answer you!! The letters underlined should be sent as one character (ie: MM is four dashes) and stand for Russian letters not covered in the english alphabet.

1. ARE YOU PERMITTED TO COMMUNICATE WITH ME?
1. DOZWOLENO LI WAM SOOBMMATSAA SO MNOUT or, if you prefer, DOZWOLENO QSO?
2. YOUR SIGNALS RST IN .
2. WAMM SIGNAL RST W .
3. ARE YOU PERMITTED TO RECEIVE MY CARD VIA CENTRAL RADIO CLUB, MOSCOW?
3. DOZWOLENO LI WAM POLUOEAT MOUT KARTOOEKU OEEREZ CENTRALNYI RADIO KLUB, MOSKWA?
4. ARE YOU PERMITTED TO SEND ME YOUR CARD?
4. DOZWOLENO LI WAM PRISLAT MNE

Operating position of FS7AA Marigot, French St. Martin.

WAMMU KARTOOEKU?

5. DO YOU KNOW WHEN YOU WILL BE PERMITTED TO COMMUNICATE FREELY WITH US AGAIN?
5. ZNAETE LI WY KOGDA SMOJUTETE SWOBODNO SOOBMMATSAA SI NAMI?
6. CAN YOU TALK TO ME WITHOUT USING MY CALL SIGN?
6. MOVETE LI WY GOWORIT BEZ SIGNALA?
7. NO, NOT PERMITTED
7. NER, NE DOZWOLENO.
7a. YES, IT IS PERMITTED.
7a. DA, DOZWOLENO
8. HOW ARE YOU?
8. KAK POVIWAETE?
9. GOD BE WITH YOU ALL (A STOCK RUSSIAN CHRISTIAN GREETING).
9. GOSPODX SO WSEMI WAMI.

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W6MEK	254
G6ZO	254
W3KT	253
W8JIN	253
WØYXO	252
W6ADP	252
W8HGW	251
W5KUC	251
W8BRA	251
ZL2GX	251
W3EVW	251
W2BXA	250
W8NBK	249
W6DZZ	249
W8BHW	249
W3JNN	249
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W6ZCY	204
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W4CYU	203
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W6RM	202
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W6LW	201
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W7OY	200
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W6BAX	197
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KG6GD	145
W3IXN	141
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W7BTH	135
G3AZ	133
W6TEU	133
W6RDR	133
W6AUT	133
VE7KC	133
W6OBD	131
ZS2CR	131
CR9AN	131
W6IDZ	130
G8IP	127
W7ASG	129
W7GBW	127
G5BJ	126
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PK6HA	124
G5VU	124
W6NRQ	123
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W1CLX	245
W2NSZ	240
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W1BIH	236
W9HUZ	236
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W8UAS	231
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W2GT	227
W4GG	226
W8DMD	225
W2HZY	225
W3OCU	224
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W5MPG	223
W3DRD	220
W5FFW	220
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Next complete HONOR ROLL will appear in the September issue.

160 Meters

(Thanks to W1BB)

February 5th "TEST"—WWV N6, showing, 32F, calm, noise level low. However, NO European DX was heard except HB9CM who came through very briefly. North American DX was pretty good and started off with YN1AA on 1830, then HR3HH on 1834 and TI2BX. W6KIP/6 came through to W1-land for about a half hour period, 459. No LORAN on 1850 kc for this test! W stations on were W1BB, W1EPE, W2PP, K2BWR, W3RGQ, W3EIS, W3WGO, W3ECP, W5SOT, W5WEH, W5JHW, W4LK, W4VNE, W6KIP/6 W8WVT, W8GDQ, W8KIA, W8ANO, W9PNE, W9NH, W9UCW, W9PUZ, W9WZU, W9UCW. Absence of European DX is not understood . . . KP4KD is missing as he changed QTH's and is rebuilding . . . Pete, G8JR, running 8 watts, suddenly popped through on Feb. 8th and worked W1BB, 339. . . .

February 12th "TEST"—WWV N5, QRN very heavy, Weather windy, rainy, cool. Under these conditions no DX was expected. However, it turned into quite an eventful morning! At 0450 GMT, DL1DA, 1835, came in 569 and was heard working GW3KSZ. Tuning a little lower we ran into DL1FF, 549. At 0505 HB1CM/HE (Who had managed to make an unexpected return trip to Liechtenstein) was found on 1769 kc with a 449 signal. All three were worked by W1BB who was the first W for DL1DA and the HB1CM/HE contact being a "FIRST" and new country for Stew. All these stations disappeared at 0530 but reappeared at 0550 weakly. HB1CM/HE finally faded out at 0610 but DL1DA hung on until 0700. Not a single G station was heard nor any NA DX stations which points towards some very strange skip conditions on 160. GW3KSZ, G3IGW, G6BG, GW3KSQ, G3ERN and G8IL were known to have been active.

February 19th "TEST"—WWV N7, Weather clearing, QRN medium. North/South path was good with YN1AA putting in good signal and working W1, W3 and W8. YN1KK was also on and worked by W8GDQ. VP1EE was on but not heard. No European DX at all. W1ZL recently visited HH, HI and VP5 with the intention of getting on 160 but found the "red tape" and going rather tough so met with no success. Another "First" was W2QHH's contact with FP8AK/VP2.

Here and There

KV4AA was happy to log visits from W1DQH, W6WZS, W2FLL, K2CJN, VP2KB, KP4TF, W2AIW, W3SRC, W9GEX, FS7RT/W6ITH and W2BBK/FS7AA/FP8AK/VP2. Quite an influx! . . . Howie, W2QHH, has what is probably the only QSL from FG8Z (St. Martin) which dates back to an 80-meter 1947 QSO. FG8Z was killed, shortly after, in an air crash . . . Al, W8-PQQ, asks stations to QSL direct to MP4QAL (See QTH's) and he will handle the return distribution. Al also handles OY7ML and XZ2OM cards. Send stamped evelope for direct answer. Same goes for W4ML and FY7 cards . . . YA1AM cards should go ONLY via ARRL or RSGB . . . Gus, W2HMJ, announces very local DX competition from his 14 year old son who is now KN2ROR . . . Officers of the recently formed Willamette Valley Radio Club are: Pres. W7HXG, V.P. W7GBW, Sec'y W7AC. They plan a monthly bulletin . . . Bill, ex-KP6AB, keys from DL4YW . . . W2HQL reports SVØFY, George, Box 564, Athens, Greece . . . W3LTW/3 is on again, from Bethesda, Md., after a two year QRT . . . Quite a get-together occurred at W2BBK when Doc showed photos of the FS7AA and FP8AK/VP2 escapades. Present were VR3A, FP8AQ, W2EQS, W2GT, W2JT, W2ZBO and W2AQT . . . W2ZCZ keys from K2USA . . . Another VK1 call has been issued, VK1RD on Macquarie Island . . . Wendell, on a recent USA, and Cuban, tour visited WØAIW, WØDAE, CO2BL, CM9AA, W2WZ, VE2LI, WØELA and WØYXO . . . Via ARRL we hear that Hopen Island, abode of LA9LD/P, counts same as Spitzbergen . . . Yves, FF8AJ, went QRT in March . . . W8YHO offers a DXCC Directory, price one dollar postpaid. This contains an alphabetical and numerical listing of the 2900 DXCC members as of January '56 QST . . . VK7UW, A3, 14165, 1400 GMT, seeks South Dakota QSO to complete WAS (Via WØIOS).

73, Dick, KV4AA

Here is KV4BO operated by John Denham ex-W6NPO. Located at Trunk Bay, St. John, KV4BO is the only ham occupant of this Virgin Island.

Note—We appreciate your kindness and efforts as reflected in the contents of Box 403. We do our best to answer these either directly or via the DX column. Should we goof on any please bear with us as the incoming mail has assumed slightly awesome proportions, QSL's and all, which makes it quite impossible for the DX staff (me) to treat each letter as it properly deserves. We shall try to muddle through, to the best of our ability, answering queries over the air and by post. Thanks, KV4AA.

NOVICE

for the novice and technician

Reported by
Walt Burdine, W8ZCV
Waynesville, Ohio

It has been said many times that ham radio makes the prince and the pauper alike as peas in a pod. This I truly believe, for truly, you rarely meet a ham that acts as though he were the only person in the world. The ham spirit is the same whether the ham has a million or can ill afford the price of a new *6*L6 for his low powered rig. You will often see the ham fraternity fall in to help a less fortunate brother get going with their own time and equipment. Often a group of hams will decide that some person that has had bad luck is worthy of some special help, so they just pitch in and get the job done in true ham fashion. Some radio clubs keep a small rig around to loan to a fellow that has to go to the hospital or to the ham that has had a misfortune enough to lose his rig through some disaster.

Henry Schneider (14) W5HNS, Lake Charles, Louisiana says this station coupled to the Catfish Special Antenna (CQ, November '55) can work the DX. Henry says that Antenna is the best. He has 44 states confirmed so far, that's his proof.

A collection of QSL cards will teach you more geography in one evening than a month of study. Those cards are a small attachment to the parts of the world from which they came, we know there is some one there that has the same interests at heart. Some QSLs are works of art and some carry gems of wisdom. The **QSL** of *John A. Janssen, PAØDOC* carries this gem of wisdom, *"Amateur Radio is World Friendship."* Can any sentence sum up the aims and ambitions of the ham better than that one? There is a lot of friendship carried by the stamp that you place on your QSL card. Did you QSL your last QSO or are you waiting until he QSLs first, will you even QSL when you get his card? The QSL card is the last courtesy of an enjoyable QSO. The job of confirming costs me more than the running expenses of the station, it's money well spent.

Do you remember 1921 when we amateurs were given full reins to all frequencies above 200 meters? Those frequencies were at that time considered to be useless for purposes of communication and you can see what the ham can do with them now. I would venture a guess that at least 85 per cent of the world's communications are carried on these frequencies. That is the result of the persistent experimenting that was carried on by the amateur radio fraternity. We still have lots of radio frontiers to cross. New methods of modulations will likely be discovered that will narrow the bandwidth required. A system of pulse modulation will likely be found that will enable a single frequency to carry a number of voice modulated stations at the same time. We will need them if the number of operators keeps getting larger all of the time. Other frontiers are appearing daily, truly the amateur radio operator never has enough time to get all of his projects completed before others appear on the horizon.

One of our biggest problems at the present time is that of interference to other forms of transmissions. A number of amateurs are at present off of the air because of TVI but other amateurs are busy on that problem, it just seems that the radio industry knows that the amateur will clear up that problem too. We must give a big hand to Philip S. Rand, WIDBM, F. E. Ladd, W2IDZ and R. L. Drake, W8CYE for their work on this problem, doubtless there are numerous others. They are making it possible for us to operate at our own convenience at the same time keeping peace in the neighborhood. Bob Drake's new filter for the six meter man has made it possible for me to operate at any time that I choose, that way I will be able to try for that 6 meter WAS.

With this station of James H. Bryant, W4FNN, Post Office Box 363, Corbin, Kentucky is coupled to a vertical ground plane antenna. He is able to work a lot of DX on 40 meters. Watch for him. He has worked 20 states in his first 14 days of Operation.

Given a little time to finish the job the amateur will solve the TVI problem as he has done countless others. TVI can be licked and the amateur that just throws up his hands and gets off the air doesn't help the cause at all. Numerous articles* have been written to help you clean up the transmitter so that the wave that leaves it will leave without any spurious frequencies super-imposed upon it. Read these articles and apply their teachings to your transmitter.

** CQ, Sept. 1951 page 11, TVI-free 40 meter transmitter.*

CQ, October 1953 page 28, TVI-free 40 meter 807 transmitter.

CQ, July 1954 page 14, 2 Meter TVI filter.

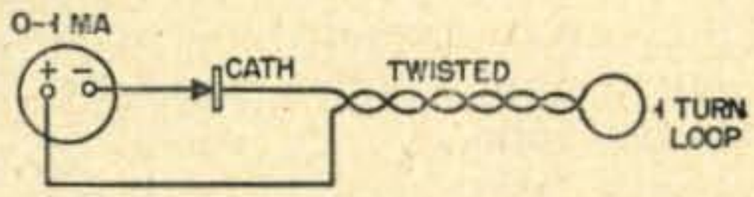
CQ, August 1955, page 25, RF on Your Chassis.

QST, June and July 1954, 50 MC TV1, Its Causes and Cures.

QST, April 1953, TV1 Hints for the VHF Man.

Hint of the Month

How many times have you wished that you had some simple gadget that would tell you if that transmitter or receiver oscillator was oscillating? This unit can be used for that purpose, to tune up low power stages in low power transmitters and to tune the multiplier stages in a converter. It is not frequency sensitive, therefore it does not have to be tuned to the frequency as does a grid-dip meter. After you have tuned the stage for maximum output the unit can be put aside for the grid-dipper to locate the frequency of the tuned stage. The unit really shines when tuning up the multiplier stages in uhf converters because the coupling link can be close coupled to the circuit by a long link if necessary. That can save the tubes in the multiplier stages from undue strain due to off-resonance plate current loads. My unit uses an 0-1 milliampere meter, a 1N34A crystal diode and a link made of #18 insulated wire with a one turn loop on the end. I have used it as an indicator up to 435 Mc. It is about the handiest gadget in the hamshack.



News of the Nets

A card was received from John K. Roller, W8SJG, 223 Licking Street, Toledo, Ohio informing me that a six meter net meets every night from 2030 until 2330 EST at 50.1 Mc. Regular net members are W8NWC, W8SMD, W8RBQ, W8SVB, W8NKG, W8STX, W8VKR, W8MTJ, W8KOV, and W8SJG. Any six meter operator is welcome to call into the net at any

LOOK AT THAT, WAC for Skip Cuevas, KN6JQJ, now K6JQJ technician but will soon have the general. Skip runs 45 watts, he uses a dipole 65 feet up. Skip's address is 1030 West 93rd Street, Los Angeles, California.

Jim Rabil (14) KN4GWV, 1520 West Haven Blvd., Rocky Mount, North Carolina received his ticket November 22 and has had over 800 QSOs with 38 states. His station is an S-85 receiver and he uses a Globe Scout 65-A into a 65 foot doublet, 40 feet high.

time. The purpose of this net is to promote occupancy of the band, to serve as a training aid for operators.

The New Hampshire Novice Net (N.H.N.N.) meets every Sunday at 3731 kc. For full particulars contact Den W1DYE, 17 Canterbury Road, Concord, New Hampshire. The purpose of this net is to aid in training operators and to gather news for traffic nets.

The Pittsburgh Novice Net meets at 7:161 Mc. every Thursday at 1545 EST. All area novices are invited to participate. The aim of the *PNN* is to train operators for the civil defense, to pick up traffic for the general net and to help any aspiring ham to get his Novice license and get going.

The present members of the *PNN* are WN3EHP, WN3FGS, WN3DMD, WN3DBH. WN3CSF, WN3EXB, WN3FGT, WN3DAH, WN3DWO, WN3EPM, WN3DME, WN3ERK, WN3ERJ and W3ZEW. Any Novice interested in this net can phone or write to: Buzz Sadler, WN3ERJ, 815 Holland Avenue, Pittsburgh 21, Pennsylvania, phone FRemont 1-9974 for help and information.

A very nice certificate is sent to anyone working six members of the *PNN*. Each Novice will send the letters *PNN* after his call when calling a general CQ.

I made a speech at the *Dial Radio Club* at *Middletown, Ohio* a few weeks ago and the subject was *"Using the VFH bands"*. Now there is nothing new about my making a speech but the oddity is that the president is Mike Brown, WN8DJY of Middletown. Mike is a 14 year old and doing very well as a Novice, and as a club president. Good luck to him and all of the *Dial Radio Club*.

A letter just arrived from Bill Smith, KNØCER, 811 Gaskill Drive, Ames, Iowa telling me that he has been appointed contest manager for the *National Novice Technician Association*. Bill says that the *N.N.T.A.* is sponsoring a contest similar to the *Novice Roundup* to be known as The WASN Marathon. The prize to the winner is a *Heathkit* Q-multiplier all built up and ready to go. Only Novice operators can win the prizes, generals can have fun.

The contest begins at 0300 EST, March 15, and ends at 0300 EST June 15, 1956. The contest runs only one month at a time and the winner is the novice with the greatest score at the end of the three month period.

Monthly reports must be mailed to the contest editor by the first of each monthly contest. Stations may be worked for scoring purposes only one time per contest period, that is once each month.

The object of the contest is to work as many stations in as many states as possible each month. All stations count on the *WASN* certificate, it might be quite a task to work a Novice in all of the states.

The cost of joining the *National Novice Technician Association* is two dollars and can be sent to the headquarters: 4490 Van Ness, Fresno, California. The *NNTA News* is worth the two bucks fellows.

W8CAN

Two Questions for the Month

Q . . . Give the formula for determining the power input to the final amplifier stage.

A . . . The formula for finding the power input to the final is known as Ohms law and can be remembered by a very simple method. Draw a circle as shown and place the letters inside as shown. To find the unknown quantity, just place your thumb over that letter and read the answer from the two remaining quantities. E is expressed in voltage. I is the current in amperes. R is the resistance in ohms. Power is expressed in watts. Thus

$$E=IR \qquad R=\frac{E}{I} \qquad I=\frac{E}{R}$$

and $p=IE$

These are the most important formulae in the study of radio and will answer most of the mathematical problems for the amateur radio operator. Example: The final draws 100 ma. at 650 volts, what is the power input? 650 x .1= 65 watts.

Q . . . How is bias voltage developed in the grid-leak bias method?

A . . . Whenever the grid of a tube becomes positive with respect to the cathode, the positive charge on the grid attracts some of the electrons emitted from the cathode. The electrons flow back to the cathode through the external d-c grid-return and cause a current flow in the circuit. If a resistance is placed in series with the grid-return, a voltage drop will occur across it when the current flows; the end of the resistor nearest to the grid will be

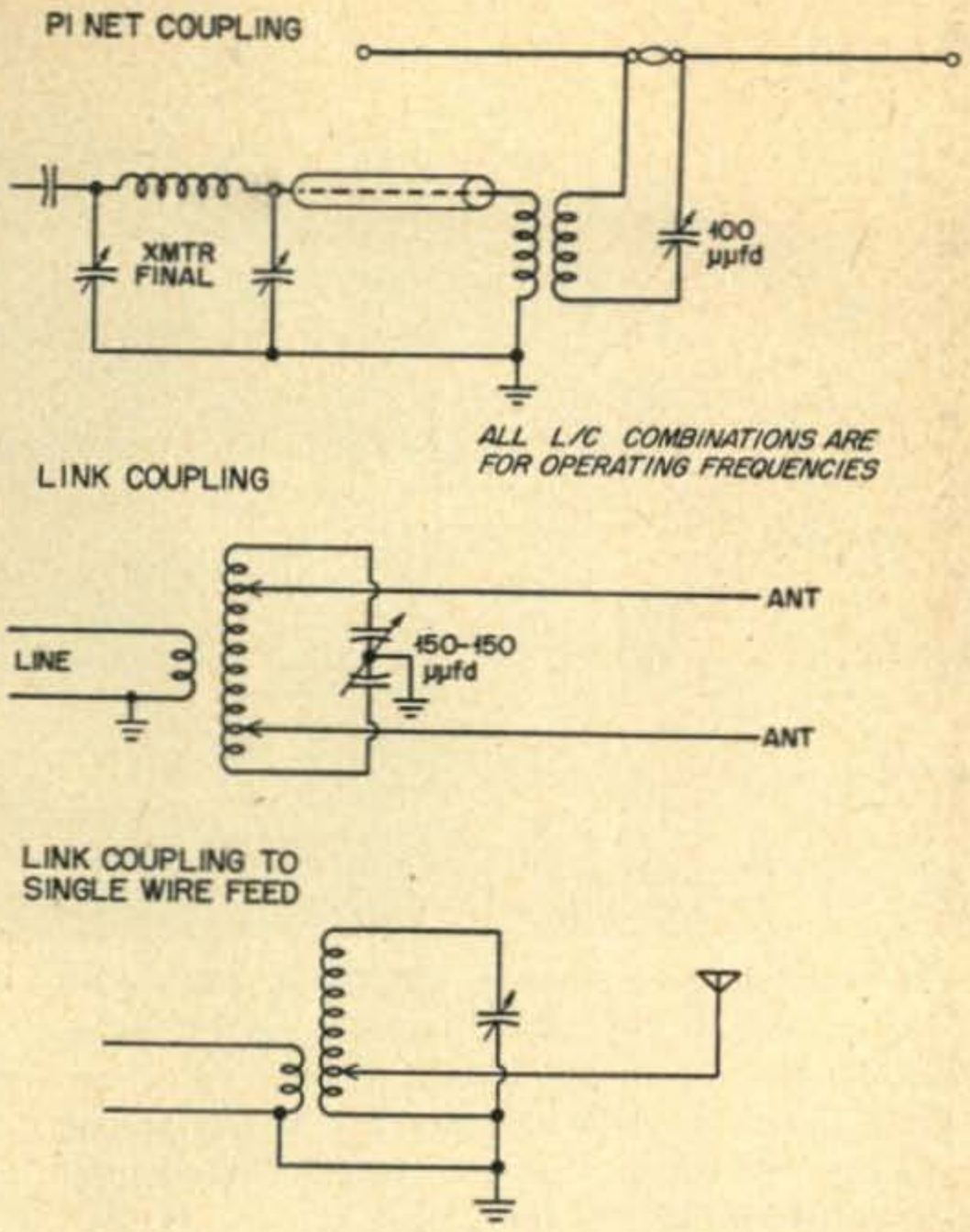
negative with respect to the ground end (cathode) thus causing the grid to become negative with respect to the cathode. The voltage drop across this grid-leak resistor consists of a varying a-c voltage superimposed on a constant value of d-c voltage, which is proportional to the effective value of the grid current impulses. The a-c component is bypassed back to ground by the parallel condenser. By measuring the d-c grid current with a d-c milliammeter in series with the grid-leak, the grid bias be calculated by multiplying the grid current by the resistance of the grid-leak. Grid-leak bias adjusts itself automatically with any variation in r-f excitation. One of the disadvantages of grid-leak bias is that the bias voltage is proportional to the r-f voltage, loss of excitation causes loss of bias voltage, thereby allowing dangerously high values of plate current to flow in the plate circuit. These high plate current surges could damage the tube or completely ruin it.

WARNING—Harmonic radiation

A communication just received from the FCC offices says that they are sending out a great number of second harmonic radiation notices. They say that this is just due to the increased use of the low frequency bands and the additional monitoring facilities. The main offender is the 3.7-Mc operators, their second harmonic falls out of the amateur spectrum therefore they can cause interference to services other than the amateur service. The transmission of signals outside of the amateur bands is forbidden by law and must be checked as soon as possible.

Harmonics are generated by using high grid-drive current and therefore high grid voltage. Some of the popular Novice transmitters

Peter Brandenberg, K2MMT, 1839 Andrews Avenue, Bronx 53, New York says he can operate phone but prefers CW. Pete is stuck at 19 states but I'll bet he won't stay here now that he is on 15 meters.



double in the final amplifier stage, thereby having an output with high harmonic content.

The best way to locate the unwanted harmonics is to use a grid-dip meter and check all suspected circuits for the unwanted radiation. This routine method of checking will locate the offending section of the transmitter and localize the work area.

The first thing to do for the suppression of the unwanted second harmonic is to shield the transmitter completely. This should help rid you of a part of your second harmonic. Be sure that your transmitter cabinet is grounded to a good earth ground with as short a lead as possible.

Probably the best way to suppress most, if not all, of your second harmonic content will be to construct an antenna tuner to place between the transmitter and the radiator. Up to 40 db attentuation of the harmonic content can be affected by this method. Some representative antenna coupler diagrams are shown below and these properly adjusted should improve your signal and suppress enough of your second harmonic signal that you need not worry about the small amount radiated. It is a good idea to check with a grid-dip meter while feeding the output into a dummy load.

Operate the final with as small an amount of grid drive as is needed for full output. Operate all multiplier stages at a low output level to keep the final as free of harmonic output as possible. Check to see that all connections are clean and well soldered as this can cause a good deal of harmonic radiation. Be sure all antenna connections are clean and tight. So called all-band antennas might radiate more of your second harmonics than an antenna cut for one band.

12 year old Tom Fonseca, KN2QWM, 405 - 33rd Street, Union City, New Jersey and his home-made 6L6 Transmitter have worked 15 states. Tom says there will be more Boy Scouts getting licenses there soon, his Dad, W20IA, Scoutmaster and teacher of the troop will be sure of that.

Letters

Boy! what memories this letter brought back to me and I expect that you will get a kick out of it too. Fred Minshall, KN60WI, 1968 Arnold Hiway, Concord, California writes this gem.

"Dear Walt: Been reading ur Novice Shack in *CQ Magazine* and enjoy it very much—one thing I like about it is that it isnt just one or two Novices but a lot of them. I'll keep this short as I can but being an old goat 60 years old I got a big kick out of life when I got my Novice license about four months ago.

Then is when I started in to worry—shall I get a transmitter or just brag about my license? Yeh I got a *Heathkit AT-1*, about a week later I had all of the parts in the cabinet, plugged it into the power out-let and took a deep breath and shoved the key down. You guessed it, no wiggle on the meter. I checked the transmitter over 20 times and not a thing seemed to be wrong with it. I had never seen a resistor or a mica condenser before, much less try to figure the values. So W6QEN, a real swell fellow to know, took a look and found two resistors that had to be swapped in place. Any ten year old kid could have found it, but not me.

Later on I finally got nerve enough to answer a CQ and that's when the custard hit the fan. I heard my call, KN60WI RRR—I grabbed the key—forgot to take the transmitter off standby—forgot to put the receiver on standby—meter wasn't wiggling—noticed the transmitter on standby—I fixed that and the receiver let out a howl—I fixed that—grabbed the key and sent CQ a couple of times and then came to that I had forgotten the call of the other station. I'll bet that young fellow had a good laugh, but I didn't care. We tried to talk for about five minutes and finally sent 73 and shut up. All I got was U R RST—then an S and then 73. Talk about a thrill.

I'll bet 40 dollars most every ham can remember his first time on the air but I got a bigger thrill out of that first attempt at a QSO than did the old widow gal with 7 kids when the rich old bachelor asked her to marry him.

Go ahead and laugh at me fellows, but maybe Walt would like to know how some of you fellows got through your first QSO, I know I would. CU in CQ. 73 Walt. Fred."

Here is a hint from Earl Henson, W3ZNF, Star Route Camden, Delaware that can be put to use by many readers. Earl writes:

"Dear Walt: I passed my general during the Christmas holidays but still find much of interest in your column. I especially enjoy the construction hints and am looking forward to your announced series on test equipment.

The rig here is that most frequent of combinations *AT-1* and *S-40-B*. As a Novice I worked 30 states and 80 and 40 meters, but after "graduating" I switched to 15. At first I had trouble getting the new *Heathkit VFO* and the *AT-1* to work together on 15, as a matter of fact, without modifying the *AT-1* they won't! However the remedy is quite simple.

Just mount an 'on-off' switch (ceramic insulation such as the Mallory 161C) on the front panel to the left of the meter as viewed from the front. Disconnect the wire presently connected to lug 2 of the oscillator coil XC and connect it to one lug of the new switch. The other lug of the switch is connected to lug 2 of coil XC. Leave the switch open for 15 meters so that the final will not double. The procedure is to operate the VF-1 on 40 meters (40-20-15-10 position) and triple to 15 meters. Mr. G. M. Krepp, engineering consultant for the *Heath Company* gave us this dope so it is official. Since making the change I have worked many 6's and 7's on 15 meters. I should soon have WAS. What a band!

I am on the air most every week day morning from 10 to 11 EST, and will be glad to work any western Novice that calls me for the first 15 minutes of that hour. I would like to QSO with Nevada, North Dakota, Wyoming and Utah. Please fellows, QRS to 12 WPM and space—your—letters. Cordially—Earl."

Ed. F. Rice, W9NGP, Route 2, Box 393, Oconomowoc, Wisconsin, writes:

"Dear Walt: While teaching in the Waukesha High School and conducting my radio club there, many of my students have mentioned that it is very difficult to get code practice off the air because the few stations sending code practice are too weak here in Wisconsin or else they are sending too fast for the beginner. I have taught code to more kids than you have pages in the new economy size *CQ*, and I find copying off the air is great practice form the first day.

Now I have a fair signal at night on 80 within a radius of 150 miles from Milwaukee, Wisconsin and I am planning to send code practice at a very slow speed for my own group. I was going to reduce power, but if you think others would benefit from this slow speed code I can run full power and cover the area very nicely. The sked will be about 9:00 P.M. nightly. Could you advise me as to the frequency to use, I had thought of 3715 kc since I can be crystal controlled there. 73 Ed."

Editor's Note: Thanks Ed for the offer and I express for my readers that might benefit from this practice many thanks for your effort. I think 3715 kc would be a good frequency. We need more stations that will do the same thing for the new ham and the aspiring ham and also some of the fellows that are starting for a commercial license, we need those too you know and they also have to start someplace. This country is badly in need of radio personnel. It will help to keep our country up with the rest of the world in electronic technical personnel.

Whit Russell, KN4EEK, 310 Segrave Street, Daytona Beach, Florida has 44 states and has a 90% return on his QSLs. Whit works all Novice bands except the two meter band, but, likes the 40 meter band best.

Les Johnson, KN6PUR, 4410 Woodman Avenue, Sherman Oaks, California writes:

"Dear Walt: I'm a keen follower of your *Novice Shack* columns each month in CQ. Keep up the good work.

I've had my ticket since 1-21-56 and I've worked 24 states, Washington and all call areas. The rig is a home brew transmitter running 25 watts to a 6146. I'm using my dad's *HQ-129-X*. I'm 13 years old and a student in Junior High School. Most of my family are hams, my mother is K6HON and my dad is W6QKI.

I would like to sked anyone in Idaho, Delaware, Maine, Minnesota and Vermont. Thanks and 73. Les."

Bob Sloate, WN7BMI, Post Office Box 68, Billings, Montana writes:

"Dear Walt: I'm from Montana. I don't think I have ever read any letters in your excellent selection in *CQ* from this third largest state, so I thought maybe I had better hurry up and represent it if no one else had.

I've been a Novice for about four months and am now in a patient wait for my Conditional. I am running about 40 watts to an end fed antenna and have a total of 28 states worked using the 80 and 15 meter band.

I have had lots of fun with this hobby but I have one gripe coming: PLEASE QSL when you receive one. Being in Montana almost everybody I work wants a QSL from me. Sure I'll QSL, but it kind of hurts when I get maybe a 75% return.

So, that's my contribution Walt, and I hope that this helps in your collection of states. 73 . . . Bob."

Help Wanted:

Den Jackson, SWL-W6, 2213 North Tamy Lane, Santa Ana, California needs to meet a local ham or some one interested in getting a license.

Billy Moore (12), 2232 South Tanglewood Road, Decatur, Georgia could use some help on the code.

Morris Feigenbaum (37), 160 Euclid Street, West Hartford, Connecticut has passed the Novice test but wants some ham to rent or otherwise make available to him the diagram for a 14 tube *Meissner* Traffic Master.

Lindsay Cleveland (16), Band Company, Kentucky Military Institute, Venice, Florida needs some one to explain ham radio to him and help him get a Novice license.

Kenneth Gale (14), 223- 54th Street, Brooklyn 20, New York wants help in code and theory.

Phil Elpiner (16), 11214 Superior Avenue, Cleveland, Ohio needs help in code and theory.

Robert (Mickey) Groh, 521 White Springs Road, Geneva, New York needs help in code and theory.

Jimmy Barnett (15), 403 Bradley Street, Abingdon, Virginia needs help in studying the code and he wants some pen pals interested in ham radio.

Paul Rakow, 430 Cedarville Street, Pittsburgh 24, Pennsylvania, Phone: MA-1-2458 needs help in code and theory.

Miss Nancy Brower (18), 15221 Eleven Mile Road, Roseville, Michigan. Resident Address: 5231 Second Street, Detroit 2, Michigan needs help with code and theory.

To get your name listed in the help wanted column just drop a note with name and address and the kind of assistance required to Walt Burdine, Waynesville, Ohio. It is not necessary to send the letter to the New York office of *CQ*. Those whose name appears in help wanted are desirous of obtaining aid in studying for their license. Thank you for helping them get a license and for any aid you may offer.

That just about puts the 30 mark on for this month. Thank you all for reading the column and thank you who have taken the time to write me letters that have guided the writing of this column. Good luck, 73, Walt. ■

Fifth Vermont QSO Party

The Tri-County Amateur Radio Club of Brattleboro, Vermont announces the 5th Vermont QSO Party and invites all radio amateurs to participate. Vermonters are urged to work as many out-of-state stations as possible so that interested amateurs can earn credit toward WAS, WANE and W-VT awards. Here are the details:

(1) Time: 24 hour weekend period from 6 PM EST Saturday May 5th to 6 PM EST Sunday May 6th, 1956.

(2) No time limit and no power restrictions.

(3) Scoring: *Vermont Stations:* 1 point per contact and multiply total by the number of States, U.S. Possessions, Canadian Provinces and Foreign Countries worked during contest period.

Outside Stations: 5 points for each station in Vermont worked and multiply total by the number of Vermont counties worked during the contest period.

(4) Credit for contacts with the same station on another band will be given in order to promote more activity on higher bands.

(5) A certificate will be awarded to the highest scoring station in each State, U.S. Possession, Canadian Province or Foreign Country and to the highest scoring station in each Vermont County. In addition a W-VT certificate award will be sent to any station working 13 of Vermont's 14 counties, provided the station has not previously been issued this award. Party logs showing required data will be accepted in lieu of QSLS.

(6) No specific frequencies. Use as many bands as possible.

(7) General Call: for Outside stations "CQ VT". Vermont CW stations should identify themselves by signing "de VT (call) K".

(8) Contact information required: Vermont stations send number of QSO, RST or RS report and County. All others send number of QSO, RST or RS report and State, Possession, Province or Country.

(9) Logs and scores must be postmarked not later than June 15th, 1956 and should be sent to Tri-County Amateur Radio Club, c/o Vito Rizzi, 24 Chapin St., Brattleboro, Vermont.

Vermont Novices are urged to get into the fray. Also stations in Bennington, Essex, Lamoille and Grand Isle Counties, please plan to be active. Everyone interested mark your calendars now so you won't forget, and good luck!

Crystal Ball

Here are some of the features we are preparing for early publication in *CQ*, just to whet your anticipation.

A two tube crystal controlled two meter transmitter
More dope on short antennas with facts on their gain
Picture story on how to use coax connectors
Twenty meter capacity hat beam
Five element two meter Quad
An eighty meter Quad
Sideband adapter using Collins mechanical filter
Super-Exciter, AM-FM-SSB-CW
Improved DX-100 keying circuit
Soldering to glass ■

V H F

Reported by

Sam Harris, W1FZJ

P.O. Box 2502, Medfield, Mass.

Moon Bounce

One of the modes of propagation mentioned in the last column was Moon Bounce. As of the present writing no amateur communication has ever been established using this medium. The work done by W4AO and W3GKP on Moon Bounce (*March 1953 QST*) has paved the way for any adventuresome souls to carry on and make this a standard VHF communication path.

The mathematics involved in proving that Moon Bounce is a practical mode of transmission are, by present standards of equipment, slightly on the gloomy side. Using the maximum legal power available and getting the most efficiency from your final and feed line, the amount of signal coming back from the moon is on the marginal side even when using antennas having gains in the 25 db region.

The mathematics involved in calculating the maximum distance which could be worked on VHF a few years ago were pretty gloomy too. The mathematics weren't faulty. They were just based on insufficient data.

So let it be with Moon Bounce

I would like to take this opportunity to serve notice to all and sundry that I am about to go on a moon-happy project.

We feel that the chances of success on this project are much better if we enlist the aid and advice of all V.H.F. men the world over. Our schedule of operation for the summer months will appear in the June issue of *CQ*. Regularly scheduled transmissions will start on the 21st of May and will continue until one of you lucky people hear me.

In general the schedule will consist of transmission of cw signals during the first five minutes of moon rise and the first five minutes of each succeeding hour until the moon has put in its appearance on the west coast. Transmissions at moonset will begin when the moon is setting in England and will continue at hourly intervals until moonset in the Rhododendron Swamps.

Obviously when the moon refuses to put in an appearance at some reasonable hour the schedule will be interrupted and Helen will get some sleep.

What kind of equipment will be required? The answer to this will determine the success or failure of the project. Obviously you need a receiver. Not just a run of the mill receiver but a real whing-ding. Nothing short of a noise figure of 2 db or better will be acceptable. (This presents no great problem in view of the fine converter articles which have appeared in the last few months).

In addition to a good noise figure it will be necessary to get the band width of the i-f receiver down to something on the order of a few hundred cycles. Probably the most effective means of achieving this kind of selectivity is by the use of the old fashioned crystal filter. Backing this up with an audio band pass filter will give all the selectivity which can be handled. It must be borne in mind that we expect to communicate with this equipment. Detection of the signals is only the first step. Identifying them and getting information from them is the object of the game.

Antenna-wise the problem becomes somewhat more difficult. It would be very desirable to be able to control the elevation as well as the horizontal direction of the antenna. As long as the transmissions are taking place at Moonrise or Moonset, the standard antenna mount will suffice. This will limit the listening period to a very short time however. (Maybe the genius who thought up the flip-flop antenna will come up with another idea.) From the standpoint of antenna gain you just can't get too much. Quite the contrary. You'll be lucky if you can get enough. Don't be misled by ill-informed people who suggest that you should replace 64 element beams with twin fives. In order to have any measure of success you will have to think in terms of twenty db or more. (And the more the merrier.) The particular type of antenna you choose is not of any great importance. Just make it *big*. When you think it is as big as you can possibly handle the best rule of thumb is to double

it for good measure. This will insure having a beam that is at least half big enough. As a guide to the kind of thinking other people are doing we have first hand from Herby (W6QKI) that he is planning to use sixteen fifteen element yagi's in his effort to span the continent. (I'm afraid to ask W2NLY what he is planning for fear my imagination just can't take it.)

Transmitter on this end will use a pair of Eimac 4X250-B's in the final running at a full kilowatt. This will be fed to four fifteen element *Telrex* long johns spaced approximately four wavelengths apart and backed up by square corner reflectors.

Receiver will use 416 B's and will be mounted at the antenna.

I wouldn't want any one to get the idea that all you have to do is tune in at schedule time and there you are. This effort will require lots of patient listening and lots of work on equipment. Our only hope of success lies in the ingenuity of the V.H.F. fraternity as a group. If we all do our share we are assured of making contact. The way has been paved for us by the dogged determination of Ross and Bill whose untiring efforts paid off for them only after three years of trying. Three years have passed since their first announcement of success. Isn't it about time we did our share?

Windblowers VHF Society

Four State Jamboree

Where New Jersey, New York, Pennsylvania and Connecticut.

When From 2:00 P.M. Saturday, April 28, 1956.

Till 2:00 A.M. Sunday, April 29, 1956. Check will be made between Windblower stations at start and finish of Jamboree as well as at 8:00 P.M.

Why To afford all interested stations the opportunity to work all four selected and specially placed Windblower stations for a certificate of merit and accomplishment. To provide publicity for the Windblowers V.H.F. Society and rejuvenate interest and activity on the two-meter band after the usual winter "lull." To provide a club on-the-air activity.

Payoff A special certificate, suitable for framing, bearing all Windblower members' calls, and verifying to "Four State Jamboree" operating accomplishments will be mailed to all non-member stations working all four Windblower stations during the specified period. K2DFS will design and be responsible for the production of the certificates which will be secured after the "Four State Jamboree" when the quanity needed will be determined.

Stations to contact:

W2IMG/2	Middletown, New York	144,450	144,500
W2IMI/1	Redding Ridge, Conn.	144.090	144.270
W3CIP/3	High Knob, Penn.	144.320	144.720
W2GEX	Tenafly, N. J.	144.900	144.180

C'mon fellas, this sounds like a good one, with a VHF certificate in the offing too.

Aurora

The last month has lived up to the predictions and provided the V.H.F. bands with openings aplenty via the northern lights. In general I have managed to be away on at least two of the best openings but it seems like you just can't miss them all. Since the flare up in February there has been at least one or more openings per week. The majority of them coming, conveniently enough, on week-ends when everybody was ready to go. For those of you who don't think aurora propagation is worth much I would like to point to the list of nineteen states contacted in the last two months of operating. All on aurora. These states plus two districts in Canada were all located in the northern portion of the country and oddly enough in the eastern half of the northern portion. No reports of auroral activity from west of Minnesota or south of Virginia have been received. W4HHK of Collierville, Tennessee is reported to have worked some W9's on aurora during one of the March openings. This would be the farthest south that aurora has been reported.

We don't like to keep harping on this but it's getting so I can't find any new states on aurora and it's high time someone prodded you a little bit to get in there and pitch. It is inconceivable to me that no one in the western half of the country has had an auroral contact. If signals can get from the east coast for distances up to 1200 miles to the west it seems that some signals should come from the west coast back into the central states. There is activity in Minnesota and the Dakotas for instance, and someone must be located farther west for the boys in those states to work. Or maybe auroral activities are partial to people who live east of the Mississippi. Let's hope it's not for lack of trying.

Antennae and Such

The choice of what antenna to use for maximum effectiveness on the V.H.F. bands is, to a great extent, a matter of what type of operating the particular individual is contemplating. A highly directive antenna is not a good choice for the individual who is located in a low activity area but who is only interested in local rag chewing. If he is in a high activity area, he might well choose a highly directive array as a defense against interference. If he is interested in working DX, he has no choice but to use a high gain array. He is still faced with the problem of what kind of an array to use. He has the choice of two basic types. The first of these is the broadside type of antenna such as the "eight half waves in phase with reflectors" commonly called a sixteen element phased array. Combinations of this basic type are used to make 32, 64, and 128 element arrays. The second choice available to the DX minded is the Yagi type of antenna. This type generally employs five or more

parasitic elements in conjunction with a driven dipole. The use of up to fifteen elements is quite common and the gain from one such device will range from 6 db for the five element to as high as 16 db for the fifteen element.

A marriage of these two basic types is accomplished when a number of parasitic arrays are fed in phase. For instance eight 5 element beams stacked four high and two wide to form a 40 element broadside array of Yagi's.

Until the last year the argument which went on about the relative merits of the two basic types was as pointless as arguing about which polarization to use. Lately, however, the experiments on scatter type propagation have added fuel to the fire by pointing out (although in a somewhat inconclusive manner) that the large area type of array loses some of its effective gain when used to receive scatter signals. Single long Yagi type antennas are reputed to be exempt from this loss in effective gain. Unfortunately the gain of single long john antennae is not sufficient for reliable scatter work to be accomplished when limited to the maximum power allowed for amateur operation. Feeding several long johns in phase lays them open to the same loss in effective gain as any other broadside array.

No serious-minded person who has any understanding of the factors involved would ever recommend replacing a 64 element broadside array with a 5 element Yagi. Some people, particularly those who have never tried it, might recommend replacing a 64 element beam with a *15*-element Yagi. If they did this with a view toward receiving stronger signals on scatter, they would most certainly fail.

The fact of the matter is that you just aren't going to get your antenna too big. Regardless of what type of propagation you are contemplating or what antenna you choose the chances of getting it big enough so that you will lose effective gain are very slim. On Two Meters for instance it would require an antenna with an aperture of 200 feet before any appreciable loss would be encountered and then this doesn't mean that you won't get any gain. It means that the effective gain will not be as high as the calculated gain. The time to start worrying is when your calculated gain starts to get in the vicinity of 33 db or more (*You worrying?*)

CW for your Gonset

After hearing W1QF of Lowell, Massachusetts working CW with his Gonset linear amplifier I got the idea that maybe some of the rest of you lucky Gonseteers would like the scoop on how he does it. Dick sent me a schematic of his linear with the modifications marked. The modifications are so simple that a reprint doesn't seem necessary. Dick took the short way out by inserting a key in the Meter jack. As will be noticed on your diagram the B- lead returns to ground through the antenna relay coil. The B- return is cut at its junction with the relay. Both the B- lead and the relay lead are brought out through a hole in the chassis. The antenna relay must now be supplied with a source of 12 volts dc when in the transmit position. Dick installed a dpdt switch which provides normal operation in one position and when switched to the other position allows operation on CW. When not transmitting this switch must be returned to the normal position or the 12-volt d-c supply must be controlled by the send receive switch.

Although Dick uses the Gonset receiver into an external i-f strip when operating at home, he has installed a b.f.o. for use when operating portable. This consists of a 6-mc oscillator using a 6C4. Power is robbed from the receiver power supply. A circuit for this is available and will be in the next column. (*I think I got it too late for the printer to do anything with it this time.*)

A word of caution from Dick. The key has large quantities of voltage on it. *Be careful.* Better yet, use a keying relay and be safe. The keying relay can be operated from the same supply as the antenna relay.

High Power

Returns from the column in which W1RUD suggested the use of 10 kw power for experimental purposes have been numerous. The consensus of opinion is in favor of the proposal provided that the operation be restricted to a small segment of the band and be used only on a scheduled basis. (Now all we have to do is convince the F.C.C. and buy some stock in the power company and we are in business.) It also was pointed out that what we need is ten thousand 100 watt stations to get the most out of the bands.

Receivers

In order to make on the teletype with the machine mentioned last month we had to build a new two-meter converter. The results were so gratifying that we are in the midst of writing an article on how you too can have the best in VHF converters. The new job works on 6 Meters, two Meters, 1.4 Meters and .7 Meters. Noise figure on the lower three bands is better than five db and the .7M band runs about 10 db. Provision for the use of preamplifiers is made and the performance is then without peer from the standpoint of hearing weak signals. It is however a bandpass type converter and despite the widespread use of this type I personally think that when the receiver is to be used in locations where there is any activity (either commercial or amateur) a tunable front end is the only answer to the interference problem.

Telrex Antenna

For the benefit of those who are still waiting for me to come up with some dope on the *Telrex* 15-element long johns, I can only say *BE PATIENT*. Getting the article prepared is considerably hampered by the fact that I have got

four of them to play with and the results from such a small array are rather difficult to evaluate, (Besides that my towers keep blowing down and I have to waste so much time putting them up again.) and then there are all those band openings and RTTY and new receivers and moon bounce and Helen keeps wanting to know when the six meter antenna will be finished and everything.

Gonset Multiplier

From the amount of screaming we have received about the *Gonset* multiplier it looks like everybody is afraid they will get beat by the powerful five watter. Be advised therefore that any station who meets the following qualifications will be eligible for the Gonset multiplier. Plate power input to the final stage of the transmitter must be less than 15 watts. Total plate power to the final and driver stage not to exceed 20 watts.

Contest score must be accompanied by a complete schematic of the transmitter with voltages noted and a complete schematic of the converter used with a description of the i.f. system. (If the receiver has a bandpass of less than 25 kc you needn't bother as you are not in the *Gonset* class.)

Letters

Indianapolis, Indiana: The Hoosier State sends us its contribution via "Hartz" W9FVI:

"A bit of bad news, I hear from W4MKJ that Tom, W4HJQ and Shelby, W4WNH both lost their antennae about three weeks ago. He added that they are coming up with ninety-six elements and sixty-eight element jobs soon, before the contest, I hope. (*We do too, won't that be fun.*)

"We here in Indianapolis are a little ahead of you on your plea to move up in the band. About four months ago we established 145.800 Mc for round town bull sessions. We call it the Sassafras Net. There is no call-up; most everyone monitors the frequency. It has solved the problem here for the few who are able to work out." (*Glad to know you boys got there first, Hartz.*)

Salt Lake City, Utah: K. J. Farnsworth (W7WLV) comes forth with:

"Just a line to let you know that there is now a six-meter ham on the air and very active from the state of Nevada. He is running 550 watts output to a five over five beam. He points his beam east and calls every day at 0700 and 2000 M.S.T. He is on 50.1 and 51.2 Mc." (*Hurray for Nevada, hope to see you on the band soon for a good Nevada to Massachusetts contact.*)

Glendale, California: The "Golden" state joins us with a note from Pete Ferguson (K6QLG):

"When my technician license came through about a month ago, I borrowed a Gonset communicator to try my luck on a band I had been told was as dead and uninteresting as a two-penny nail. Dead! In the first three hours I worked five stations and had long QSO's with all but one. That trial sold me on Six Meters and I found it anything but dead.

"I will be running a Viking I modified for Six Meters with a pair of 813's for a 600 watt linear amplifier. The receiver is a home built converter on a HQ-140-X and selectivity should be enough to pull through the weak DX. A Heath Q multiplier helps too." (*Thanks for the nice letter Pete, glad to welcome you to the ranks.*)

Eugene, Oregon: A representative of the "Beaver" state, John Winkelman, W7QMS, has he following to say:

"Some two-meter activity is taking place here in Eugene since the formation of a VHF club here not too long ago. Communicators and 522's prevail, the average power run hence is rather low. Antennas are on the small side in comparison with other areas, but some of the boys are planning bigger and better things." (*News from Oregon is always welcome and kind of hard to come by John, so let's hear from you more often.*)

Rockland, Massachusetts: Our own "Bay" state hears from Roger Jarvinen (W1VDE) who sez:

"The two-meter band has been open here in Rockland all day, March 3. Now mind you I didn't get in any of this except for a contact with W2CXY, because my antenna feedlines were off and I can't go up the eighty-five feet to fix them with no ground man available. (*You did better than me Roger, I was away from home during that opening.*)

"My dad, WN1GKE reports from the sunny state of Florida that the activity down that way is for the birds, only worked one station in one month." (*If your dad is still there Roger, have him look up the letter from W4YGT, Gene, in Deland, Florida on page 83 in February issue of CQ.*)

Silverton, Ohio: Ron (W8PCK) from the "Buckeye" state sez:

"A few lines for the Cincinnati and southern Ohio gang. Wednesday evening 8:00 P.M. net drills are a big success with average attendance of twelve stations at 50.7 Mc. Pop, W8SVU, has a pair of 24G's on and I hope to have my forced air cooled 829B glowing soon. Pop monitors 50 Mc during his lunch hour around noon and I pick up at 4:00 P.M. and spot check through the evening.

"DXpedition planned for next summer to Arkansas. For all guys who need Arkansas contacts on 50 Mc, check 50.01, 50.1, and 50.4 last two weeks in July. Will be mobile to and from Arkansas through Tennessee, and Kentucky." (*DXpeditions always popular Ron and we're glad to hear about this one so far in advance. We'll be looking for you on six.*)

Minneapolis, Minnesota: Representative of the "North Star" state Roger Peterson (WØRGO) reports:

"We are mainly interested in six meters at present and would appreciate one of the brains figuring out a six-meter converter using a similar tube lineup to what W6AJF has in his two-meter rig, using a 30-35 Mc I.F. in conjunction with the NC-300. Local six-meter activity around the twin cities is very good and a spattering of DX makes it interesting. A net is in the making in the area on Sunday nights at 2100, and all interested operators are welcome and urged to join in. WØBD, WØUYR and WØRVH among others are trying to create interest in the organization.

"A higher power rig and a beam are in the making here and hope to have them ready before that anticipated 'Once in a lifetime' conditions come to pass. Setup at present is a 6146 modulated by 6L6's at about 40 watts." (*Net news is always good news Roger and there seem to be more and more nets and clubs forming which are concentrating on VHF work. Glad to know there's one in your area.*)

Maryville, Tennessee: W. J. Huffstetler (W4BXG) and the "Volunteer" state come through with:

"W4FHT is getting up a forty foot tower with a 32-element collinear antenna on it. KN4HPL is a new XYL operator now heard on Two Meters. W4VKW, Tom, K4CSA, Ray and KN4CNX, Ben are now on Two Meters and are calling into the East Tennessee two-meter net. These boys are in Knoxville. KN4EYE is now mobile on Two and W4ZEN, W4FHT, W4VTT and W4BXG are all making plans for a two-meter mobile installation this spring, all will be operating on 145.2 Mc. (*Tennessee is now on wheels.*) W4UVU is now on Two Meters from Athens and is working nightly with W4LNB in Chattanooga and some of the gang in Maryville and Knoxville. KN4HAU is getting ready for the DX season, he's getting an 80 watt rig lined out and it sounds good." (*All this news is good news to us, OM.*)

[*Even more of this will be found on page 114*]

Results:

1955 World-Wide DX Contest

Frank Anzalone, W1WY
14 Sherwood Rd., Stamford, Conn.

We didn't realize what we had let ourselves in for when we offered to give our Hon. Editor a hand in checking the 1955 CQ World Wide DX Contest. There is a terrific amount of detailed work connected with one of these contests, and this was no exception. Our committee, although small and new in contest work, fortunately was not short on DX savvy.

We believe the rules as set down by Larry LeKashman, W9IOP, are good ones, and they were followed to the best of our judgment. We hope any errors, and there are bound to be some, will be forgiven.

There were three points in the rules that confused some of the contestants.

Para. C/ under #8 Awards. Section II, was inadvertently omitted. Some European participants wondered if they were permitted All Band operations. Luckily they disregarded this omission and proceeded to run up fine All Band scores.

Section IV, a new addition, also had some of the boys confused. They wanted to know if, besides operating a minimum of 5 hours, it was also necessary to show 50 contacts. Of course not. It was one or the other.

#9, SCORING, Section I. This was the biggest point of confusion, probably because of the ruling of previous years, according to which an All Band entree was also eligible for all the other Single Band awards. Usually the "hot shot" who ran up a big All Band score would also win a major portion of the Single Band awards. Here the Committee took a firm stand. It was agreed that the intent of this rule was to eliminate this unfair duplication and, therefore a station would be eligible for ONE AWARD only. If a log was submitted for two or more bands, it was judged for an All Band award, unless however, a contestant requested that he be judged for a specific Single Band only. We are sure that this will meet with the approval of the 1,005 participants who submitted logs.

As in all DX contests, there was a cry, and justifiably so, for a power multiplier. Our Contest offers seven separate awards for each country or section, making it a big field with room for everybody. The final results show that all the winners were not the high-powered boys, and some were really low-powered.

It was decided to give separate awards to stations operated by members of the Armed Forces in Germany and Japan.

Very few Clubs observed the requirement of submitting a list of club participants in order to be eligible for an award. However, the Committee took on the extra work, and Club scores will be found listed.

We will not bore you with statistics, as the listed scores and groupings speak for themselves. However, there are a few points worthy of special mention.

All the logs were not this amusing to (left to right) Ed Hopper W2GT, Ray Yard W2DKF, Frank Anzalone W1WY, Charley O'Brien W2EQS, and Ben Lazarus W2JB. M. A. McIntire W2BO and Richard Rowe W1ODW were home working on the tough ones.

In the Phone Section, Single Operator CX2CO topped them all. Ricardo set what we believe is a new record in this category. W6YY had the highest score for W's—a real performance for a West Coast station that is at a decided disadvantage, especially on the lower frequency bands. VQ4RF was disappointed in that he did not break 100,000, but his score on 21 mc. was easily tops for a single band. LU1BK must also be given credit for his fine showing on 28 mc., which is an indication of things to come on 10. W2HJR and its crew did a bang-up job in the multi-operator section, and it was only the multiplier on the lower frequency bands that kept the final score from reaching astronomical figures.

In the CW section, Single Operator, W2HJR with W3GRF at the key, is King for 1955 with the highest score ever turned in by a W but K2EDL gave him a run for it. The rest of the honors are evenly divided among the old reliables and newcomers. It was W3LMM at the key that made it possible for W3VKD to make the Top Ten. Old reliable KH6IJ with 961 QSO's was way ahead in that department, and W3JTK topped everybody with 102 different countries.

In the Single Band competition the highest scores you will note were turned in by the boys of the U.S.A. Take a look at W4KFC on 14 mc. Also W2AGW, W3JTK and G2LB. Another fine performance was W2WZ on 21 mc. and W8FXG on what seemed a "dead" 40 meter band.

Some interesting comparisons are some of the close scores. To mention a few, W5CKY and W5KC on 21 mc., DJ1BZP and DL1JW

PAØUN—David turned in the 3rd highest score in the World on CW with this efficient and compact rig.

on All Band. But for a real close one, look up the scores of JA6AA, JA6AD and JA1AA on 14 mc.

KV4BK bemoaned the fact that it was "no contest" competing against KV4AA. He will be surprised to find out he is All Band winner for the Virgin Islands. Dick decided to go for the Single Band only this year.

All the winners were not blessed with QRO rigs.

VE7AIH had only 30 watts with primary supply from a gas-powered generator. You will note many other winners in the "A" power classification. Lowest claimed power used was 5 watts by SM4GVH and SP8CK.

Look over the scores carefully, fellows, and start making plans for 1956. There are many choice spots that are yours practically for the asking.

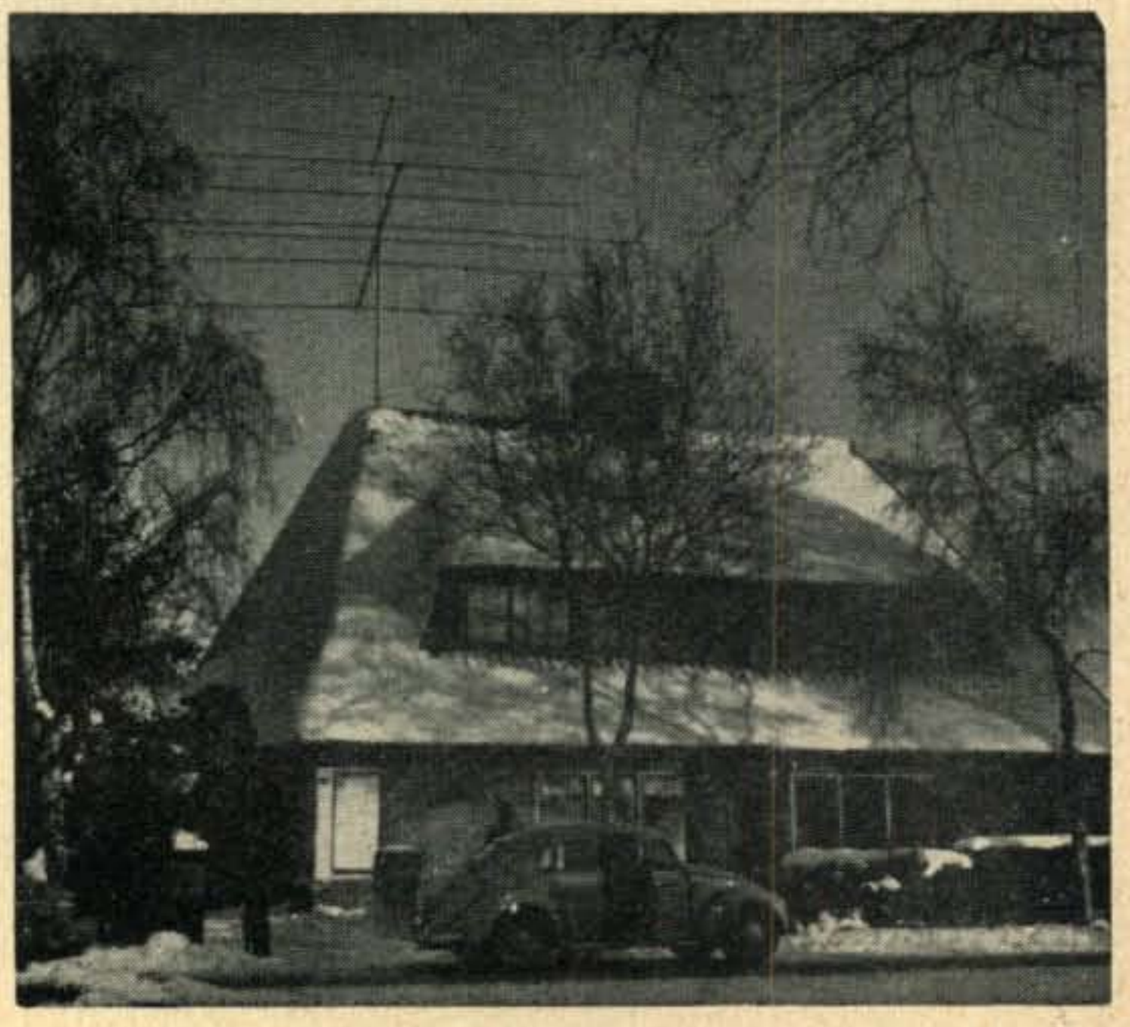
Your committee consisted of Frank An-

W6YY—John had the highest 'fone score of all the Ws. His indeed is a dream layout. What you see is only the receiving position; the transmitter is on the other side of the room.

Transmitter —Four 1 KW PA's driven by a 32V-3; 813 on 1.8 Mc.
Receivers —75A2 and HRO-60 plus DB-23 preselector.
Antennas —Vertical top-loaded on 1.8 and 3.5 Mc.; Ground-plane on 7; 5-el beam on 14, 70' high; 3-el on 15, 75' high and 3-el on 10, 81' up.

PAØUN—His home, his car and his rotary. The 28 Mc job is at the top. 9 ft. below are the 21 and 14, the 21 being mounted in front of the 14-mc array.

Transmitter —PP 807s with a new multi-band final tank, bandpass coupler and antenna tuner.
Receiver —AR-88.
Antennas —3-el beams on 28, 21 and 14 Mcs.; and 400-ft. long wire for 7 and 3.5 Mcs.



FONE

Top For Each Band

28 mc.	LU1BK	—	26,152
21 mc.	VQ4RF	—	94,848
14 mc.	W3JNN	—	60,713
7 mc.	JA1VP	—	1,344
3.5 mc.	OZ8KR	—	560

CW

Top For Each Band

28 mc.	W3MDE	—	3,392
21 mc.	W2WZ	—	66,222
14 mc.	W4KFC	—	171,776
7 mc.	W8FXG	—	30,149
3.5 mc.	G5MP	—	5,760

zalone W1WY, M. A. McIntire W2BO, Ben Lazarus W2JB, Ray Yard W2DKF, and Charlie O'Brien W2EQS. We owe thanks to Ed Hopper W2GT and Richard Rowe W1ODW for their assistance. All around cooperation has enabled us to get these scores out to you at the earliest date since the inception of these World Wide DX Contests. ■

Phone Section

Single Operator

Number groups after call letters denote following: Final score, number of QSOs, number of Zones and number of Countries. Letter designates power used. A—Up to 30 watts; B—Up to 125 watts; C—Up to 500 watts. D—Over 500 watts. *Winners in Bold-Face Type.*

NORTH AMERICA

UNITED STATES

All Band					
W1PST	9000	58	21	39	–
W1YWU	1450	23	7	18	C
28 mc.					
W1ONV	120	6	5	5	A
21 mc.					
W1RIL	68,978	264	26	65	C
14 mc.					
W1QJR	10,094	81	14	35	B
7 mc.					
W1APA	130	7	5	5	C
21 mc.					
K2BHP	26,599	146	19	48	C
W2DJT	8,944	72	13	30	B
W2UTH	2,232	31	6	18	–
14 mc.					
K2KAK	5,060	48	16	28	–
K2DEM	72	5	2	4	–
All Band					
W3ECR	113,669	226	65	132	D
28 mc.					
W3ZEQ	2,400	30	10	20	C
W3UKO	814	15	9	13	B
21 mc.					
W3ZPO	4,290	51	8	22	–
W3UHN	602	30	4	10	B
14 mc.					
W3JNN	60,713	208	31	78	D
W3FMC	420	11	7	8	–
All Band					
W4KWY	111,300	240	57	118	D
W4TWW	26,663	107	30	61	B
W4YK	1,518	24	18	15	–
21 mc.					
W4NQM	80,160	297	25	71	D
W4DOU	18,360	102	20	48	B
W4KKG	9,456	75	17	31	–
W4GUV	1,696	25	14	18	B
W4EEO	198	6	5	6	–
14 mc.					
W4AIX	5,452	48	16	31	C
W4NZM	3,784	39	17	26	–
W4HKJ	2,310	34	12	23	C
All Band					
W5DJH	39,603	132	54	75	D
W5LFG	5,934	54	35	34	B
28 mc.					
W5ZFS	364	15	7	6	B
21 mc.					
W5KC	12,036	83	19	40	B
W5SU	3,348	36	14	22	–
W5QF	2,622	33	15	23	B
W5KNA/5	16	2	2	2	B
14 mc.					
W5LPG	10,140	78	21	39	C
All Band					
W6YY	194,484	353	92	136	D
K6EWL	2,442	29	15	18	D
K6GSJ	2,000	31	13	12	–
K6DDO	413	14	11	9	–
21 mc.					
W6BUD	20,002	106	26	47	D
W6ZZ	1,972	28	13	16	B
14 mc.					
W6VVZ	40,230	172	31	59	D
W6VSS	37,910	187	29	56	D
W6LTY	15,500	107	23	39	–
W6GVM	2,793	25	25	24	D
All Band					
W7HRH	11,061	67	31	38	D
W7WLB	3,666	30	15	16	C
28 mc.					
W7RT	2,660	36	13	15	C
3.8 mc.					
W7JLU	56	5	4	4	B
All Band					
W8JIN	137,431	271	71	132	D
W8NXF	63,504	163	64	104	C
W8DUS	11,700	61	31	47	D
21 mc.					
W8UPN	36,328	175	23	53	D
W8KZT	23,652	118	24	49	C
W8YIN	15,714	107	17	37	B
14 mc.					
W8QAD	6,321	54	19	30	C
All Band					
W9EWC	111,300	225	79	133	D
W9GWK	2,562	31	18	24	B
W9IRH	1,138	28	13	16	A
21 mc.					
W9RBI	9,120	60	17	43	D
W9HCX	88	5	4	4	–
14 mc.					
W9EZD	10,366	63	26	45	C
W9EU	450	15	6	9	C
21 mc.					
WØLRU	24,960	122	26	52	D
WØGEK	2,016	26	10	18	C
14 mc.					
WØMCX	812	21	14	14	–

CANADA

All Band					
VE4RO	44,704	146	53	74	–
VE7AIH	12,222	97	28	35	A
VO6U	30,015	226	31	56	B
VO6N	19,020	186	26	34	C
21 mc.					
VE2AFC	4,830	47	15	27	–
14 mc.					
VE3ARS	17,816	102	23	45	C
VE5VZ	408	14	9	8	C

ALASKA

All Band					
KL7ZG	26,110	176	26	44	D
KL7AGU	10,027	171	16	21	C
KL7RZ	1,100	36	11	11	B

BAHAMAS

All Band					
VP7NG	13,130	202	27	38	B

CANAL ZONE

All Band					
KZ5KA	28,320	254	29	51	C
21 mc.					
KZ5DG	3,834	68	7	20	B

CUBA

All Band					
CO2BL	219,904	362	81	175	C
CO8DL	14,210	123	29	41	–
CO8SA	13,545	171	29	34	B
14 mc.					
CO2OZ	43,510	227	25	70	B

GREENLAND

14 mc.					
OX3RC	15,504	151	14	34	B

CX2CO—Ricardo is this year's Top 'Fone Man. The trophy you see is probably one he won for another equally high DX achievement.
Transmitter —1 KW to PP 4-250A's.
Receiver —National NC-240D.
Antennas —3-el rotaries on 10, 15 and 20. Long wire on 40 and 80.

[continued on page 92]

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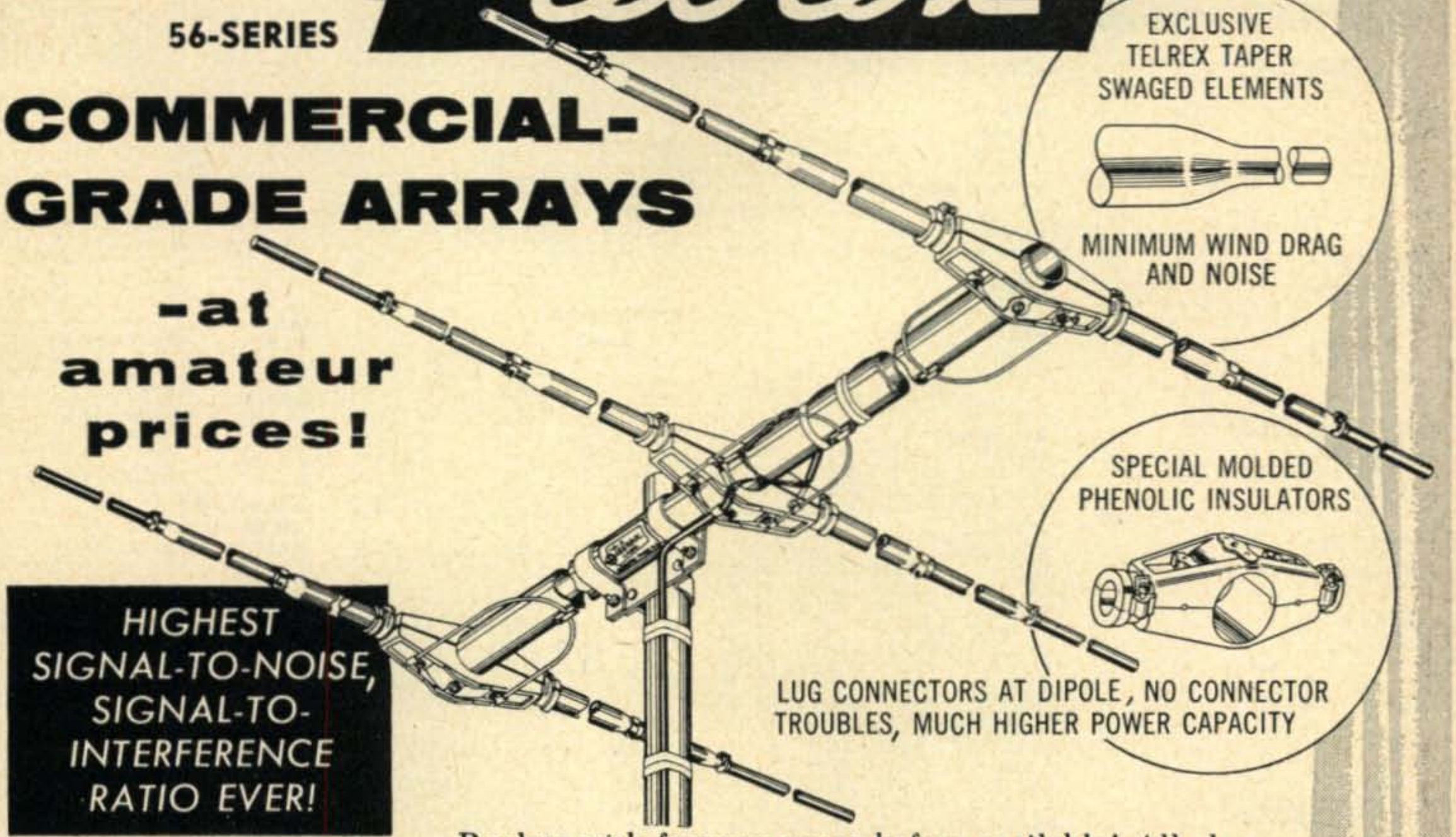

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- Hair-pin resonated
- Wind drag reduced 55%
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- All stainless steel hardware

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Replete with features never before available! All elements are insulated from the boom by a sturdy molded phenolic element support. Each element is taper-swaged and hair-pin resonated. Every model equipped with the famous Telrex balun match for balanced pattern and minimum TVI. All models are precision tuned and matched, then calibrated for easy assembly and duplication of our laboratory specifications at your site. No experimenting required!

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W4KFC—Vic turned in the highest score of all the Single Band CW entries—just another routine achievement for him. He runs a "full gallon" on 14 Mc. to a 3-el close-spaced beam on a 50-ft. mast.

GUATEMALA
All Band
TG9AD 118,846 350 63 119 B

NICARAGUA
All Band
YN4CB 19,090 160 42 41 B

AFRICA

ALGERIA
All Band
FA8DD 33,936 205 15 41 –
FA3JY 20,580 118 23 57 –

ANGOLA
14 mc.
CR6AU 8,507 75 19 28 C

CANARY ISLANDS
All Band
EA8BO 21,627 102 33 48 A
21 mc.
EA8AX 11,016 79 15 36 A

ETHIOPIA
14 mc.
ET3LF 216 8 3 6 –

KENYA
All Band
VQ4EU 855 17 10 9 –
21 mc.
VQ4RF 94,848 325 29 75 C

LIBERIA
21 mc.
EL12A 6,960 63 16 24 –

MADAGASCAR
14 mc.
FB8BC 1,328 30 8 8 A

MADEIRA
All Band
CT3AN 4,635 39 18 27 B
CT3AI 738 15 6 12 –

MOZAMBIQUE
All Band
CR7AF 3,696 43 17 19 B

NORTHERN RHODESIA
All Band
VQ2AS 17,935 91 31 54 B

SPANISH MOROCCO
All Band
EA9BH 7,175 61 25 16 –
14 mc.
EA9BC 25,344 140 17 47 –

TANGANYIKA
21 mc.
VQ3ES 34,602 178 23 50 –

UNION OF SOUTH AFRICA
All Band
ZS6ABY 9,291 57 21 36 –
ZS5OA 6,776 54 25 31 –
14 mc.
ZS5JM 26,040 126 25 45 –

ASIA

BURMA
14 mc.
XZ20M 4,628 60 14 17 –

HONG KONG
21 mc.
VS6CW 35,441 331 24 59 C
VS6AE 13,800 86 20 40 B

INDIA
All Band
VU2EJ 22,022 112 28 49 B
14 mc.
VU2AK 5,831 54 19 30 B

ISRAEL
All Band
4X4DK 319,700 481 66 164 C
4X4GB 157,251 345 46 113 –
4X4FV 136,620 333 37 101 –

JAPAN
All Band
JA1CJ 18,954 125 20 34 B
JA1ANG 4,730 44 19 24 A
JA1CR 48 7 4 4 A
21 mc.
JA3BB 26,325 200 18 27 C
JA1CO 8,568 74 15 27 A
14 mc.
JA6HK 20,835 163 19 26 B
JA7DK 1,360 25 9 11 A
JA6AV 792 20 8 10 –
7 mc.
JA1VP 1,344 28 8 8 B
JA1AGU 1,014 27 7 6 C
JA1QI 72 7 2 2 B

MACAU
21 mc.
CR9AH 9,440 87 17 23 B

MALAYA
21 mc.
VS2BD 33,968 142 28 60 C

SINGAPORE
All Band
VS1DU 4,956 51 17 25 A

EUROPE

AUSTRIA
All Band
OE5CK 109,726 322 51 115 B

BELGIUM
All Band
ON4YI 26,950 148 33 65 –
ON4DH 25,520 111 33 55 –
14 mc.
ON4LJ 6,344 73 14 38 B
ON4XW 1,416 52 5 19 A

CORSICA
14 mc.
F9WT/FC 308 10 5 6 –

W8JIN—Jim can always be found among the leaders in any DX contest. This year he made Top Ten on both 'Fone & CW. Transmitter—PP 250THs, 813 Driver and Collins 310B Exciter. HRO-5TA1 receiver and ground-planes on 3.5 and 7 Mcs.; 3-el beams on 14, 21 and 28, plus a 3.5-Mc doublet.

TOP TEN
Single Operator—Fone

CX2CO	341,214	CO2BL	219,904
4X4DK	319,700	G3AWZ	209,508
KH6IJ	250,800	W6YY	194,484
EA2CQ	240,240	4X4GB	157,251
HC1ES	221,100	W8JIN	137,431

CZECHOSLOVAKIA
28 mc.
OK1AA 3,503 41 13 18 A
21 mc.
OK1JX 9,989 82 16 33 B
OK1FC 612 17 8 9 A

DENMARK
All Band
OZ5KP 93,786 291 51 96 B
OZ7HT 41,376 262 27 69 B
OZ3Y 12,600 82 28 35 C
OZ7BG 6,720 68 19 41 C
28 mc.
OZ7AX 60 5 2 2 A
14 mc.
OZ7OP 15,183 150 18 45 –
OZ4FA 5,289 46 13 28 B
3.5 mc.
OZ8KR 560 40 2 12 B

EIRE
14 mc.
EI7M 17,542 184 16 33 C

ENGLAND
All Band
G3AWZ 209,508 387 73 148 B
G3FXB 66,766 218 43 90 B
G2AJB 8,960 73 70 128 B
G3HSM 1,612 27 11 20 –
G3HTW 1,222 33 8 18 –
G3GEN 1,161 20 11 16 B
21 mc.
G4MJ 35,192 174 24 54 –
14 mc.
G3AFM 2,320 67 6 23 B

FINLAND
All Band
OH5QN 19,680 146 25 55 B
21 mc.
OH2XK 299 18 4 9 –
14 mc.
OH6QI 8,786 113 14 32 B
OH2XA 1,798 50 6 23 C
OH2OJ 1,232 33 7 21 –
OH3RA 817 34 4 15 B
OH6PW 731 38 3 14 –

FRANCE
All Band
F9RM 69,888 251 50 106 B
F8WE 24,768 155 23 73 –
F8XP 13,082 94 16 46 B
F8ZW 10,325 83 19 40 —
F9YZ 8,094 97 14 43 –
F8CS 3,192 46 11 17 B
F3NE 2,838 34 16 27 B
F3NG 2,280 36 10 20 B
F8EY 2,100 30 12 13 –
21 mc.
F8CW 13,338 88 19 38 B
F8EG 1,725 27 10 15 –
F8VK 464 11 7 9 B

GERMANY
All Band
DL7BA 65,560 174 54 95 C
DJ1BZP 61,688 274 33 55 C
DL1JW 21,074 116 31 51 B
DL3OC 6,384 74 17 39 B
DL7DF 4,212 38 19 20 B
All Band
DL4EU 96,644 254 47 101 C
DL4ZC 28,584 205 34 72 C
DL4IO 8,911 64 26 41 –
21 mc.
DL3NE 42,630 216 25 45 –
DJ2IV 480 14 6 9 A
14 mc.
DL4VF 30,310 175 25 70 –

HUNGARY
All Band
HA5KBC 31,828 175 36 73 B
14 mc.
HA5AX 240 15 2 8 –

ITALY
All Band
I1AIJ 109,114 307 58 120 –
I1BDV 106,602 281 52 111 –
I1ZCT 40,250 197 31 84 B
I1AHW 4,876 56 16 106 –
21 mc.
I1CHJ 35,003 185 26 45 –
14 mc.
I1ASM 13,510 72 24 46 –
I1BOB 11,136 117 15 43 –
I1CLW 11,651 94 19 42 B
I1SGZ 2,044 57 7 21 –

MALTA
All Band
ZB1EB 20,790 216 16 54 –

NETHERLANDS
All Band
PAØAGA 21,294 183 20 58 –
PAØSNG 9,381 145 11 48 –
PAØEEM 5,994 99 9 45 –
21 mc.
PAØKX 21,775 118 23 44 –
PAØHJK 1,975 38 9 16 –
14 mc.
PAØULA 18,156 117 22 46 C

NORWAY
All Band
LA5YE 16,947 104 26 37 C
LA2MA 196 14 4 10 –
14 mc.
LA9AD 2,024 44 2 10 –

POLAND
All Band
SP5AH 2,706 52 10 23 –
14 mc.
SP5KAB 24,480 243 16 52 D
SP5FM 8,352 138 12 36 B

TOP TEN
Single Operator—CW

W2HJR	517,030	W8JIN	336,832
K2EDL	474,586	HB9NL	328,735
PAØUN	429,488	W3VKD	304,878
KH6IJ	395,184	W7KVU	300,645
W4DHZ	354,438	OE5JK	292,825

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Operates on either 6 or 12V by changing built-in switch. Power turned off and on by receiver control; 250V at 90 Ma. B plus, 105V at 10 Ma. regulated. Filtered filament supply; 6x4, 6x4, OB2 regulator. Completely filtered for vibrator hash. External "S" meter may be added. Weight: 10 lbs.

Cash Price: $34.00

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AF-67 TRANS-CITER

Bandswitching 160-10M. Emission A-1 NBFM or A-3. VFO or crystal operation. 5 circuit meter switch. 60 watts input to plate of final tube (6146). Coax conector and universal Pi matching network. Provisions for 40 watts of audio at 500 ohms to drive higher powered modulators, etc.

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Cash Price: $177.00

For Fixed Station Operation

PSR-117 Power Supply

Operates on 115V, 60 cycles. Power turned on and off by receiver control. Calibrated "S" meter and adjusted potentiometer installed. Cash Price: $47.00

PS-2V Power Supply

A universal power supply, but especially designed for use with the AF-67. Separate filament and plate transformers, separate rectifier and filter circuits for dual DC output. Uses one 5U4G and one 6X5GT tube.

Cash Price: $49.50

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TOP FIVE

Multi-Operator—Fone

W2HJR	417,880	ON4SZ	170,912
W3VKD	249,222	KA8AB	169,136
		DL4MW	163,582

PORTUGAL
All Band

CT1PK	106,237	301	49	100	C

ROUMANIA
All Band

YO3LM	19,276	185	19	60	A

SPAIN
All Band

EA2CQ	240,240	427	69	171	C
28 mc.					
EA4EP	7,471	85	12	19	–
EA7CP	2,384	58	6	10	–
21 mc.					
EA3IX	8,064	121	12	30	–
EA7FI	6,045	119	11	20	–
14 mc.					
EA7EV	30,448	155	24	64	–
EA4CX	21,770	187	18	52	C
EA2CB	12,312	113	16	38	B

SWEDEN
All Band

SM5ARL	39,606	162	41	82	C
SM3BIZ	30,210	245	20	75	–
SM5DW	27,472	147	29	72	–
SM4BTF	11,900	108	20	48	B
SM4AOK	2,331	35	13	24	B
14 mc.					
SM6SA	38,844	217	24	54	–
SL5CN	2,108	51	8	23	B
SM5BFR	1,518	54	6	17	–

SWITZERLAND
All Band

HB9QU	7,865	62	22	33	B

TRIESTE
All Band

IIBNU	32,017	173	30	71	–

WALES
14 mc.

GW3FPH	5,520	114	10	30	B

OCEANIA

AUSTRALIA
All Band

VK2GW	12,352	81	29	35	B
VK3ATN	115,475	286	57	92	B
VK3BW	1,400	25	19	11	–
VK5LC	13,847	81	25	36	–
VK5WO	4,464	44	16	20	–
VK6RU	8,322	62	25	32	B
21 mc.					
VK4EL	4,920	50	15	25	B

HAWAII
All Band

KH6IJ	250,800	614	62	70	D
KH6PM	101,654	339	51	55	C
KH6SP	30,888	218	26	26	C

NEW CALEDONIA
14 mc.

FK8AO	741	23	8	11	B

NEW ZEALAND
All Band

ZL1BY	91,264	261	52	72	B
ZL1MQ	49,932	167	48	66	B

RYUKYU IS.
All Band

KR6QI	1,456	20	14	14	–
21 mc.					
KR6CR	2,436	33	14	14	D

SOUTH AMERICA

ARGENTINA
28 mc.

LU1BK	26,152	160	19	37	–
14 mc.					
LU7MAJ	6,560	66	16	24	B

BRAZIL
All Band

PY2CK	105,080	169	54	131	D
PY2AHS	92,400	255	42	90	D
PY4RJ	8,700	58	20	38	–
PY2BEL	5,564	46	21	31	–
14 mc.					
PY1NC	27,144	130	23	55	–
PY4ZS	3,042	31	14	25	–
PY7VG	2,688	42	13	19	–
PY7MF	731	15	7	10	–
PY1RW	190	9	5	5	–
21 mc.					
PY5GA	1,300	21	12	14	–

CHILE
All Band

CE3DY	35,399	151	35	56	B
CE6AB	3,276	39	17	19	–

COLOMBIA
All Band

HK3FV	47,880	192	31	59	–
HK4DF	39,060	150	38	55	B
21 mc.					
HK1DZ	4,440	63	10	14	C

ECUADOR
All Band

HC1ES	221,000	475	59	111	B

NETHERLANDS WEST INDIES
All Band

PJ2AA	9,576	67	26	31	C

PARAGUAY
All Band

ZP5CF	19,092	107	28	46	–
14 mc.					
ZP5CG	8,183	73	20	29	–
ZP5JP	703	19	9	10	–

VENEZUELA
All Band

YV5AB	71,934	218	47	67	–

URUGUAY
All Band

CX2CO	341,214	555	73	149	D
CX3BH	43,731	153	47	66	B
CX2AY	6,669	80	18	21	–
28 mc.					
CX5CE	1,160	20	10	10	–

Phone Section

Multi-Operator

NORTH AMERICA

UNITED STATES
All Band

W2HJR	417,880	616	79	169	D
(W2HJR–W2SKE–W2GLM)					
W3VKD	249,222	421	78	141	D
(W3VKD–W3WPY)					
W6AM	160,268	318	83	123	D
(W6AM–W6BXL–W6KPC–W6YMD)					
W8NWO	56,885	156	60	95	C
(W8NWO–W8HMI)					
W8NGO	51,408	167	42	77	C
(W8NGO–W8CLR)					
W8EBK	23,577	110	30	57	B
(WEBK–W8EBM)					
W9AVJ	93,184	221	69	113	D
(W9PKW–W9GVZ–W9NZM)					
W9OBV	5,796	55	31	38	–
W9QQG–W9QVY–W9UXT)					
28 mc.					
W3KWH	18,090	96	20	47	–
(W3ZDW–W3SDV–W3MPK–W3KWH)					
W8BKP	21,910	109	19	51	C
(W8BKP–W8WFB)					
21 mc.					
K6EVR	11,770	91	21	34	B
(K6EVR–K6ELX)					
W6NWL	7,544	67	20	26	C
(W6NWL–K6CNL–K6LIU)					
14 mc.					
W6GRV	16,560	104	24	36	–
(W6GRV–W6BWM)					

CANADA
14 mc.

VE2ADX	1,254	37	9	13	C
(Club Station)					

ALASKA
All Band

KL7FAF	20,299	215	16	37	D
(WØLKU–KL7BOZ)					

MEXICO
14 mc.

XE1RE	3,955	78	15	20	–

IRAQ
14 mc.

ASIA

YI2AM	18,297	115	16	41	B
(Club Station)					
All Band					
KA8AB	169,136	470	50	74	D
(W1TTA–W6DUS)					
KA2NY	122,573	354	47	74	D
(Club Station)					

EUROPE

BELGIUM
All Band

ON4SZ	170,912	367	64	132	C
((ON4SZ–ON4UK)					

CHANNEL IS.
14 mc.

GC6FQ	33,034	175	24	59	–
(GC2FMV–GC3FSN)					

FINLAND
All Band

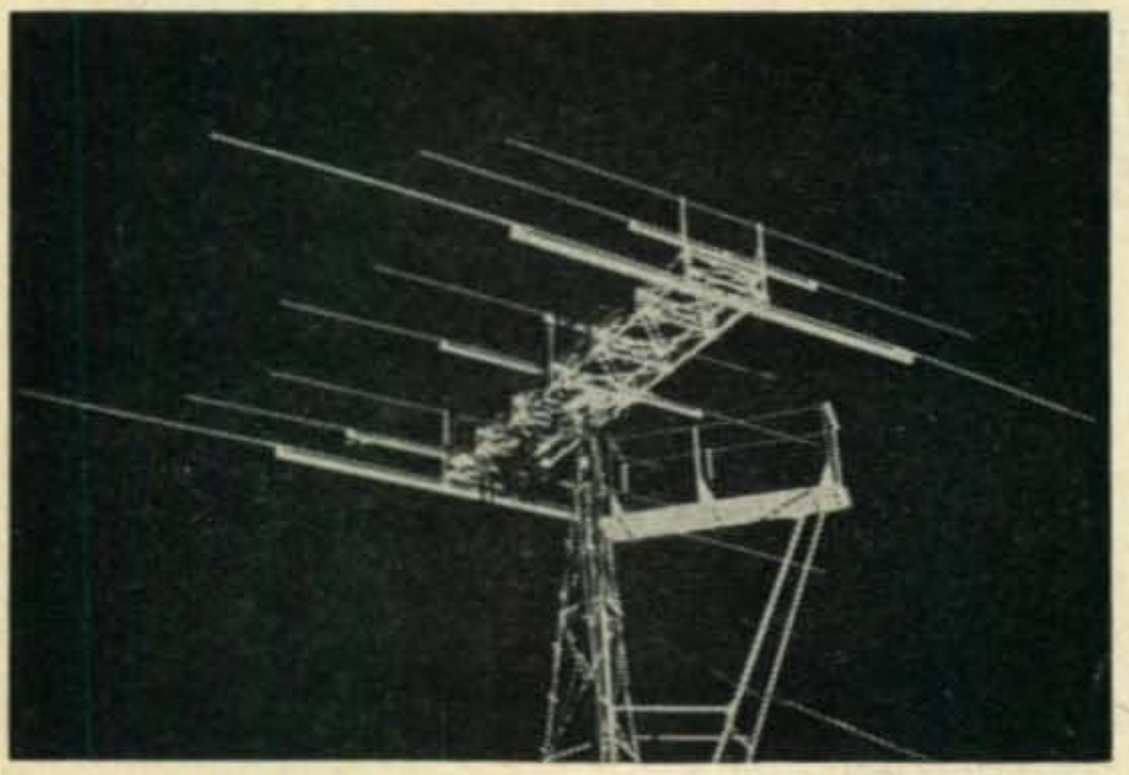
OH2TI	13,838	112	21	53	B
(Club Station)					

GERMANY
All Band

DL4MW	163,582	384	61	117	C
(DL4IQ–DL4XY)					
14 mc.					
DL4AK	24,674	156	24	49	C
(DL4AT–DL4PQ–DL4UB)					
DL4YY	21,735	155	20	49	C
(DL4CB–DL4YY)					

GREECE
All Band

SVØWT	107,952	343	52	121	B
(SVØWT–SV1AB)					



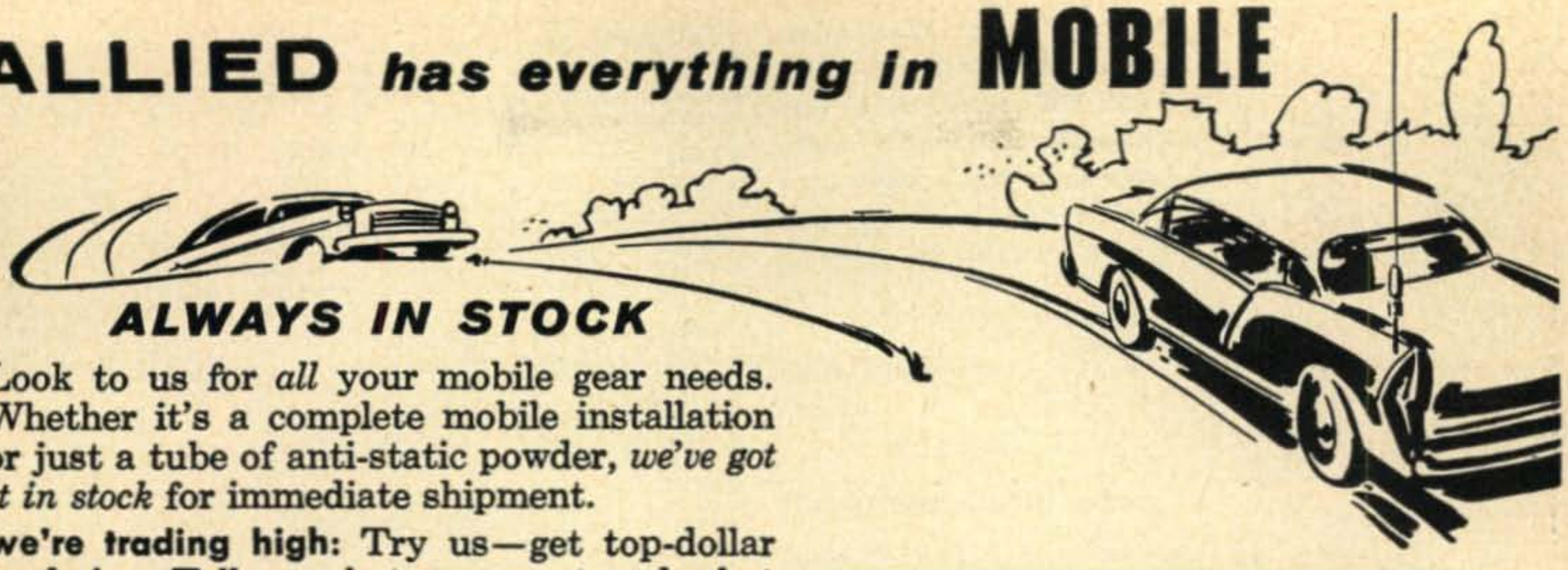
VK6RU's 10, 15 and 20-meter Rotary.

TOP FIVE

Multi-Operator—CW

HA5KBA	326,899	KA8AB	272,718
W6AM	299,472	W9AVJ	272,073
		DL4MW	262,908

ALLIED *has everything in* MOBILE



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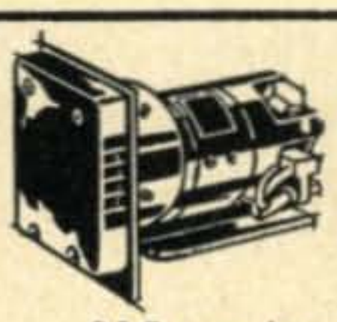

SPECIAL!

Brand-new surplus DM-42A Dynamotor. 14V DC input, output 1030V DC at 260 ma; 515V DC at 215 ma. Lower output at 6V DC input.
58 PX 172. Only.....$9.95

Popular Mobile Equipment in Stock at ALLIED:

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98 SZ 091.....$177.00

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99 SZ 044..... 89.50

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Gonset G-66 Receiver.
83 S 831.....$169.50

Power Supply-Speaker combination for above; 6-12V DC, 115V AC.
83 S 832..... 39.95

Morrow MBR-5 Receiver.
84 SX 917..... 220.00

Elmac PMR-7 Receiver.
83 S 842..... 159.00

PSR-612 Power Supply for above; 6-12V DC.
83 S 843..... 34.00

Gonset "Super-Six" Converter.
84 S 913..... 52.50

Gonset 3-30 mc Converter.
84 S 954..... 44.75

Gonset "Super-Ceiver."
84 S 914..... 119.50

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83 S 852..... 25.95

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84 S 908..... 66.59

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84 S 934..... 78.35

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James Mobile Vibrator Supply.
80 P 156.....$ 48.95

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As above, but for 12V DC.
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Master Mobile 88-60 Whip Ant.
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75-meter Hi-"Q" Coil for above.
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20-meter Hi-"Q" Coil for above.
98 C 365..... 6.81

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98 CX 149..... 29.50

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97 C 151..... 8.57

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98 C 301..... 4.09

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98 C 396..... 19.50

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HB9NL—Frank surprised even himself with his fine All-Band CW score. A single 813 with 200 watts input, home-made triple-conversion receiver and a 636-ft. long wire was all he used.

HUNGARY
All Band

HA5KBA	64,740	324	35	95	D

(Club Station)

ITALY
All Band

I1CCO	40,626	210	33	78	B

(I1CCO–I1SXZ–I1-10,011)

NETHERLANDS
All Band

PI1RRS	11,403	116	18	45	C
PAØNN	1,760	54	6	26	–

(PAØNN–PAØIN)

21 mc.

PAØAGR	16,536	128	19	33	–

(PAØAGR–PAØUAN)

SWEDEN
All Band

SM3AKW	9,765	75	23	40	B

OCEANIA

CAROLINE IS. (WESTERN)
21 mc.

KC6CG	11,200	116	18	22	C

RYUKYU IS.
14 mc.

KR6PR	13,300	141	17	21	C

(KR6PR–KR6QS)

CW Section

Single Operator

NORTH AMERICA

UNITED STATES
All Band

W1ODW	127,038	265	69	118	C
W1AZY	91,168	226	48	100	C
W1BIH	81,920	230	36	92	D
W1CJH	57,743	185	37	76	D
W1PWK	34,435	124	27	70	C
W1ZD	1,768	25	14	20	D
W1PLJ	128	6	3	5	B

28 mc.

W1WY	2,400	32	11	19	A
W1QJL	800	18	5	11	B

21 mc.

W1WLW	33,950	173	20	50	B
W1CTW	22,326	127	18	43	D
W1UGW	8,600	78	11	29	B
W1NLM	4,968	50	13	23	C

14 mc.

W1QJR	43,852	208	23	53	D
W1KFV	34,740	138	27	63	D
W1HZ	33,320	122	30	70	D
W1TYQ	29,700	121	28	62	D
W1JDE	19,800	106	19	47	D
W1DHO	11,424	75	19	37	B
W1AWE	7,353	65	14	29	–
W1ZTZ	2,924	37	12	22	–

7 mc.

W1APA	4,408	66	12	26	C

All Band

W2HJR	517,030	620	97	201	D
K2EDL	474,586	556	95	206	–
W4YHD/2	102,070	237	60	110	D
W2EQS	74,580	210	61	104	C
W2AZS	46,720	96	44	84	D
W2OTC	40,052	117	42	82	C
W2PTI	22,493	97	27	56	–
W2GKE	10,752	71	24	40	C
W2CJM	6,380	56	20	38	C
W2EVH	1,961	25	16	21	B
W2LRJ	1,652	21	10	18	–
K2DEM	946	19	8	14	–
K2KID	806	19	12	14	C

28 mc.

K2KFP	2,943	37	8	19	B
K2HZB	2,037	33	7	14	–

21 mc.

W2WZ	66,222	320	24	54	D
W2DJT	24,066	141	18	45	B
W2RUJ	20,838	108	22	47	C
K2HVN	20,034	116	21	42	C
W2PZI	6,475	62	11	26	–

14 mc.

W2AGW	149,562	411	34	92	D
W2ABM	24,806	118	26	53	D
W2QKJ	10,304	85	16	40	C
W2DOD	8,424	64	16	36	C
W2DKF	6,278	52	17	26	D
W2ZXL	3,002	31	15	23	C
W2FE	1,611	21	13	16	–
W2FXZ	903	15	6	15	C
W2DTL	690	16	9	14	B

7 mc.

W2HZY	5,520	50	14	32	D

All Band

W3VKD	304,878	477	81	157	D
W3MFW	145,323	264	60	141	D
W3ADZ	85,348	140	36	78	D
W3NCF	10,800	68	26	46	C
W3EPR	10,368	55	19	45	C
W3MDO	6,943	47	16	37	C
W3UZS	5,875	61	16	31	–
W3RRI	2,001	24	13	16	D
W3ANZ	1,840	28	5	17	–
W3HVM	1,537	22	11	18	–

Left to right, JA3DY, JA3CM and JA3AB. Don't know if 3AB used the tower in the background to run up the highest score received from a JA. He did it on 21-mc CW.

28 mc.

W3MDE	3,392	36	9	23	–

21 mc.

W3MFJ	42,840	215	22	48	C
W3AYS	29,736	147	22	50	B
W3UHN	198	9	2	7	B

14 mc.

W3JTK	154,947	404	35	102	D
W3JTC	108,295	329	33	88	D
W3JNN	102,362	291	34	93	D
W3RBE	30,705	129	29	60	D
W3FMC	20,580	93	25	59	–
W3KQD	1,457	35	12	19	–
W3YOZ	169	12	6	7	–

7 mc.

W3CPB	2,175	28	10	19	C
W3DLI	24	6	4	2	B

3.5 mc.

W3EIS	1,680	40	9	15	C
W3SIJ	90	5	5	5	B

All Band

W4DHZ	354,438	474	76	185	D
W4KVX	199,080	358	75	135	D
W4KXV	149,544	281	66	135	C
W4LZF	104,437	218	70	111	D
W4LVV	65,569	180	44	89	C
W4STM	1,767	26	12	19	B
W4PNK	74,088	208	38	88	D

21 mc.

W4KKG	20,394	116	21	45	–
W4YK	6,136	42	16	36	–
W4GUV	3,045	40	15	20	B
W4DXL	1,320	25	8	14	B
W4GCB	512	15	7	9	B

14 mc.

W4KFC	171,776	481	33	95	D
W4AIX	40,376	151	30	68	D
W4IMI	6,200	52	17	33	D
W4GF	4,212	44	13	26	C
W4JBQ	2,592	36	11	21	B
W4ZQK	143	9	5	8	B
W4HKJ	28	3	2	2	C

All Band

W5ZD	87,906	243	59	88	D
W5QF	18,172	91	30	47	C
W5BRR	15,168	82	36	43	B
W5DXW	14,364	89	41	45	B
W5CAY	9,514	73	34	37	C

21 mc.

W5CKY	32,984	155	23	53	D
W5KC	32,400	161	21	51	B
W5KTD	12,141	64	23	48	–
W5IAH	1,960	23	15	20	B
W5KNA/5	924	18	9	12	B

28 mc.

W5CEG	364	15	7	6	–

14 mc.

W5MY	13,317	82	25	44	–

7 mc.

W5FWA	621	19	10	13	C

All Band

W6ITA	207,519	355	82	139	D
W6RW	146,970	279	77	130	D
W6VUP	72,228	186	64	92	D
W6UED	57,645	192	62	73	–
W6ALQ	54,752	193	56	62	D
K6EWL	45,602	138	49	102	D
W6SWG	40,368	139	50	66	D
W6BYH	37,250	128	55	70	B
W6ID	19,980	93	40	50	D
W6NKR	19,624	84	39	49	C
W6GWQ	17,940	94	39	39	C
W6WLI	9,920	70	32	32	D
W6IPH	8,880	65	30	30	C
W6BIL	5,656	45	25	31	D
W6JVA	3,036	37	23	21	B
K6DDO	2,464	39	25	19	–
W6YY	1,600	26	12	13	D

28 mc.

W6OYD	1,092	21	11	10	D

21 mc.

W6TZD	27,790	154	23	47	D
W6VE	19,972	112	22	41	D
W6EFR	11,607	82	19	34	D
W6NWL	10,700	90	20	30	C
W6ZZ	5,334	47	18	24	B
W6MUF	5,328	55	14	22	D
W6UYW	1,628	16	8	9	C

14 mc.

W6VSS	56,742	220	31	67	D
W6BXL	41,952	178	30	62	D
W6KSM	21,164	108	28	46	D
W6BZE	19,278	97	29	52	D
W6ATO	6,732	61	19	25	D
K6DNH	5,480	62	17	23	B
W6MKH	2,695	38	17	18	D
K6OIZ	633	25	9	8	C
W6WSW	80	7	4	4	B

7 mc.

W6BYB	13,865	104	25	34	D
W6TKX	8,225	87	22	25	–
W6PQW	4,515	60	16	19	C
K6CYT	1,944	40	13	14	C

All Band

W7KVU	300,645	482	106	149	D
W7VY	161,446	345	72	106	–
W7PQE	69,306	195	62	80	D
W7CNM	30,910	129	50	60	C
W7DAA	22,950	98	34	56	D
W7IRZ	10,647	75	30	33	D

28 mc.

W7RT	1,034	25	12	10	C

21 mc.

W7AHX	14,685	101	19	36	C

14 mc.

W7ASG	32,810	150	26	59	–
W7GWD	21,681	114	27	46	C
W7TML	5,310	57	19	25	–
W7WMY	1,207	32	9	8	B
W7OAZ	798	25	10	11	C
W7EJD	546	14	5	8	–

3.5 mc.

W7JLU	176	12	6	5	B

All Band

W8JIN	336,832	450	93	184	D
W8BKP	179,630	298	82	148	D
W8RQ	147,628	262	82	139	C
W8EV	125,560	221	60	112	D
W8DUS	56,146	154	49	85	D
W8JJW	28,017	108	40	59	–
W8EBK	26,404	120	31	51	C
W8TJM	13,962	69	30	48	–
W8UMR	7,785	67	26	48	C
W8UVZ	3,478	51	25	22	–
W9WTV/8	1,458	20	12	15	C
W8MFI	99	5	4	5	B

21 mc.

W8KZT	16,309	96	20	41	–
W8SMK	3,876	45	12	22	B
W8ESR	3,608	30	15	26	C
W8RTF	2,760	44	8	16	C
W8PCS	1,525	23	8	17	C
W8DLZ	989	16	8	15	B

14 mc.

W8BRA	61,132	190	32	84	–
W8JGU	47,712	164	31	81	D
W8CED	37,944	150	27	66	–
W8STL	15,939	78	26	51	D

7 mc.

W8FXG	30,149	150	20	53	D

3.5 mc.

W8AQ	330	18	8	7	–

All Band

W9HUZ	196,912	311	90	158	D
W9TB	83,088	210	48	96	–
W9ERU	41,174	116	44	75	–
W9NII	39,038	130	55	76	C
W9GWK	33,462	118	48	69	B
W9FJY	29,980	113	46	67	C
W9FNR	18,480	80	41	64	C
W9LNM	17,827	77	38	53	–
W9RBI	7,865	50	25	40	D
W9GWS	7,236	53	28	39	C
W9IRH	6,380	55	23	32	C
W9PQA	2,345	30	13	22	C
W9GIH	1,088	9	8	9	A
W9CLH	888	17	10	14	B

21 mc.

W9ABA	35,002	168	22	52	D
W9TKR	3,344	38	14	24	C
W9KLD	2,493	37	10	17	B
W9GQM	1,932	36	8	13	C
W9LJR	396	11	4	8	–
W9HCX	322	9	5	9	B
W9WWJ	140	7	4	6	A

14 mc.

W9EU	6,345	47	21	24	C
W9FDX	3,432	33	17	28	–
W9RKP	2,135	31	15	20	C
W9HCA	260	18	7	6	B

All Band

WØDAE	91,136	204	68	110	D
WØRSL	48,906	141	57	86	D
WØSO	37,674	132	57	69	–
WØYCR	31,980	134	54	69	D
WØANF	6,936	70	28	39	D
WØPGI	3,690	41	19	26	C
WØIUB	3,362	48	18	23	C
WØGAX	912	28	19	19	–

21 mc.

WØQDP	4,800	45	14	26	B
WØTJF	4,480	47	14	21	C

7 mc.

WØVBS	323	16	9	10	C

ALASKA
All Band

KL7RZ	8,740	201	20	18	C

14 mc.

KL7GI	1,748	64	9	10	B
KL7UM	1,242	28	11	12	B

BAHAMAS
All Band

VP7NG	32,550	437	24	38	B

BERMUDA
All Band

VP9BM	67,900	463	34	66	–

CANADA
All Band

VE1EK	16,592	123	25	43	A
VE2YA	14,364	91	76	43	C
VE3BHS	14,003	131	31	36	C
VE5PM	2,700	58	20	16	B
VE6VK	52,281	290	48	63	C
VO6U	82,106	508	43	71	C
VO6N	25,594	275	25	42	C

21 mc.

VE2DR	8,024	93	8	26	B
VE3DT	6,622	67	14	29	C
VE3QE	6,154	68	10	24	–
VE5TK	4,424	125	14	14	C
VE7EH	4,002	135	12	11	C

SM4BEC—Runner-up for 14-mc CW honors in Sweden. (What's he doing with a mike?)

14 mc.
ET3LF 6,125 52 17 32 –

KENYA
All Band
VQ4RF 225,525 504 50 105 C
VQ4KPB 2,553 31 17 20 A

LIBERIA
14 mc.
EL2L 2,046 62 6 5 C

MADEIRA
All Band
CT3AB 6,480 54 14 26 –

MOZAMBIQUE
All Band
CR7AF 8,976 104 15 18 B
CR7LU 4,797 60 18 21 B
CR7CI 1,960 32 12 16 –

NORTHERN RHODESIA
All Band
VQ2AS 92,192 249 48 86 B
VQ2GW 70,720 244 40 64 –

SOUTHERN RHODESIA
All Band
ZE3JP 143,664 419 47 76 B
ZE3JO 18,354 101 28 41 A

SOMALILAND, BRITISH
14 mc.
VQ6LQ 49,500 266 20 46 C

SPANISH MOROCCO
All Band
EA9AP 113,190 347 29 81 B

SWAZILAND
14 mc.
ZS7H 336 12 6 6 –

TANGANYIKA
14 mc.
VQ3FN 40,525 219 22 46 –

UNION OF SOUTH AFRICA
All Band
ZS5U 125,188 382 53 66 –
14 mc.
ZS5JM 59,348 279 27 47 –
ZS6AJQ 16,775 102 23 38 –
ZS4AK 5,644 58 16 18 B

ASIA

AFGHANISTAN
14 mc.
YA1AM 825 23 7 8 –

BURMA
14 mc.
XZ20M 6,501 73 15 18 –

CEYLON
14 mc.
4S7KH 29,100 150 27 48 B
4S7GE 25,134 156 26 45 B
4S7MR 1,100 21 10 20 –

HONG KONG
21 mc.
VS6AE 16,692 118 17 35 B

ISRAEL
All Band
4X4CK 180,288 431 40 104 B
4X4FV 130,000 334 35 95 –

INDIA
All Band
VU2EJ 8,362 78 16 21 B

IRAQ
All Band
YI2AM 28,341 147 20 47 B

JAPAN
All Band
JA1CR 34,372 227 21 31 B
JA1VX 20,590 125 23 35 D
JA7BO 18,972 106 31 31 –
JA3DM 6,660 63 19 17 –
JA1ACA 1,972 24 14 15 B
JA1AB 1,311 25 9 10 B
JA1BC 240 14 3 3 B
21 mc.
JA3AB 37,534 272 19 30 C
JA1CO 10,726 119 12 19 B
JA3BB 5,775 60 13 20 C
JA1CJ 630 30 4 3 C
JA5AG 420 20 4 3 B
14 mc.
JA6AA 29,850 206 20 30 C
JA6AD 29,754 183 23 34 C
JA1AA 29,677 175 25 34 C
JA6AO 9,350 68 21 29 C
JA7DK 5,400 66 14 16 B
JA7AD 1,025 29 13 14 –
JA1GW 880 15 11 11 –
7 mc.
JA5AB 3,344 54 11 11 B
JA1NI 2,295 53 8 7 B
14 mc.
KA2DS 14,364 124 19 23 C

LAOS
14 mc.
XW8AB 65,065 319 29 48 –

LEBANON
All Band
OD5LX 39,388 156 21 65 B

MACAU
14 mc.
CR9AI 14,040 130 20 25 C

SAUDI ARABIA
All Band
HZ1HZ 202,224 369 42 134 B

EUROPE

AUSTRIA
All Band
OE5JK 292,825 639 60 161 C
OE3VP 39,576 190 38 98 B
OE6PH 19,536 184 19 55 –
OE3SE 12,616 94 25 51 B
OE6RP 11,060 99 21 58 A
OE3SL 5,994 100 14 40 B
OE5WW 3,822 57 12 30 B
14 mc.
OE2SP 30,107 241 22 55 –
OE5SD 12,299 149 12 37 B
OE5BW 11,826 144 17 37 C
OE5BG 11,275 141 15 40 C

AZORES
All Band
CT2BO 14,104 159 11 30 –

BALEARIC IS.
All Band
EA6AF 165,612 565 44 104 B

BELGIUM
All Band
ON4HB 78,526 358 37 105 –
ON4AU 71,808 260 47 89 C
ON4CI 3,605 49 14 21 –
21 mc.
ON4AL 1,551 49 5 6 –
14 mc.
ON4FU 31,080 242 20 50 –
7 mc.
ON4SH 1,368 54 5 19 –

CZECHOSLOVAKIA
All Band
OK3MM 209,296 620 49 157 B
OK3AL 86,180 439 36 119 C
OK1AEH 22,989 166 22 74 B
OK1KCI 20,967 210 23 64 –
21 mc.
OK1JX 37,191 217 21 48 C

DENMARK
All Band
OZ7G 97,382 283 48 98 B
OZ7BG 71,876 266 40 111 C
OZ5PA 51,830 236 34 108 –
OZ2N 34,265 385 26 63 B
OZ3PO 3,915 57 11 18 C
OZ2NU 3,700 96 6 31 B
21 mc.
OZ3FL 17,934 125 18 31 B
14 mc.
OZ7OF 1,488 52 6 18 B
OZ7AX 1,219 54 3 20 B
7 mc.
OZ6HS 714 45 3 14 B
3.5 mc.
OZ4AH 1,672 76 3 19 B
OZ1SM 418 38 2 9 –

EIRE
All Band
EI9J 53,157 275 29 58 C
21 mc.
EI5F 4,950 76 9 24 C

ENGLAND
All Band
G4CP 177,891 404 60 137 C
G3FXO 130,676 320 42 140 B
G3EYN 81,842 255 36 115 –
G2AJB 80,352 264 50 112 –
G2HPF 56,125 253 35 90 C
G6XL 38,430 142 42 63 B
G3JUV 25,063 194 19 52 –
G5FN 24,831 143 30 59 –
G3HTW 7,440 101 12 36 B
G3ESF 4,900 91 10 40 B
G3KAY 3,952 64 12 40 B
G3HSM 3,096 46 11 25 –
28 mc.
G3WP 352 16 4 4 –
21 mc.
G3DOG 33,810 205 20 45 C
G5HZ 18,864 151 17 31 C
14 mc.
G2LB 100,425 526 28 75 C
G3GEN 13,622 148 13 36 B
G3GSZ 1,701 21 12 16 –
7 mc.
G2LU 15,620 234 11 44 C
G3JVJ 5,291 106 7 30 –
G4XC 3,040 89 5 27 –
3.5 mc.
G5MP 5,760 151 6 30 C

FAROES
All Band
OY7ML 1,530 31 12 22 B

FINLAND
All Band
OH2OJ 35,875 180 40 85 B
OH2TM 20,678 124 28 70 B
OH7OU 20,520 148 21 69 B
OH5NF 20,500 179 19 63 C
OH3NY 15,879 158 16 68 B
OH6QZ 13,776 103 23 61 B
OH3TD 3,696 105 6 27 B
OH2LU 2,255 54 9 32 B
OH5QY 960 28 8 22 A
OH9QL 272 15 5 11 A
28 mc.
OH5OU 108 12 2 7 –
21 mc.
OH5OT 5,863 118 10 31 B
OH2XK 1,922 31 10 21 B
14 mc.
OH1PW 51,597 314 23 58 B
OH2WI 14,616 167 14 42 B
OH4HT 10,320 135 13 35 B
OH2VZ 9,850 120 13 37 B
OH1TI 5,031 67 10 33 –
OH2VN 4,725 64 13 32 C
OH2KB 4,030 100 7 24 B
OH3SS 3,630 82 8 25 B
OH1TA 1,647 57 5 22 A
OH6OV 1,176 37 6 18 B
OH6RZ/2 1,155 52 3 18 A
OH3TI 1,007 53 3 16 A
OH2IK 496 32 2 14 B
OH3QB 156 10 3 10 B
OH5PG 154 15 2 9 A
7 mc.
OH7NF 4,810 86 9 28 C
OH5PB 1,272 51 3 21 A

FRANCE
All Band
F3AT 90,948 267 50 106 –
F8TM 64,728 260 33 91 B
F8OP 57,728 331 32 96 B
F8CS 45,342 228 26 73 B
F8VK 31,784 228 20 38 B
F3GE 23,184 169 22 26 –
F8XY 8,272 134 10 37 –
F9RM 4,648 59 18 38 B
28 mc.
F8NS 300 20 3 2 –
F3II 90 6 2 3 A
7 mc.
F3AG 2,074 48 5 29 B

GERMANY
All Band
DJ1BZP 216,296 582 43 109 C
DL1JW 215,064 433 61 145 C
DL7BA 133,868 277 61 135 C
DL7DF 105,600 249 58 142 B
DL1EE 102,516 302 45 103 C
DJ2KU 68,876 301 36 98 B
DL3OC 58,293 268 34 93 B
DL7EN 40,826 156 41 96 C
DL1LZ 16,555 92 27 50 –
DL7BO 9,514 75 23 49 –
DL1YB 9,512 89 17 41 B
DL1YA 8,190 78 24 46 –
DL7EK 6,588 124 8 46 B
DL1EA 6,380 77 16 42 B
DJ1EJ 5,795 53 22 39 –
DL7AD 798 19 8 6 C
DL4ZC 242,388 535 55 136 C
DL4JF 131,672 394 48 103 C
28 mc.
DL6DF 1,824 28 10 14 B
21 mc.
DL1QT 12,716 108 16 28 B
DL6GB 2,208 52 6 10 B
DJ2IV 1,615 35 8 11 A
14 mc.
DL9RK 37,425 232 23 52 C
DJ2AA 12,844 146 17 35 C
DJ1KC 10,824 141 12 32 C
7 mc.
DL6MK 26,182 296 11 42 C
DJ2VY 493 27 4 13 A
3.5 mc.
DJ2YA 3,074 103 4 25 A
DJ2AE 256 16 2 14 B

GIBRALTAR
14 mc.
ZB2I 1,950 54 4 11 A

HUNGARY
All Band
HA5BI 7,920 131 11 48 B
HA5BU 1,988 40 10 18 B
14 mc.
HA5BL 3,105 78 7 20 B

AFRICA

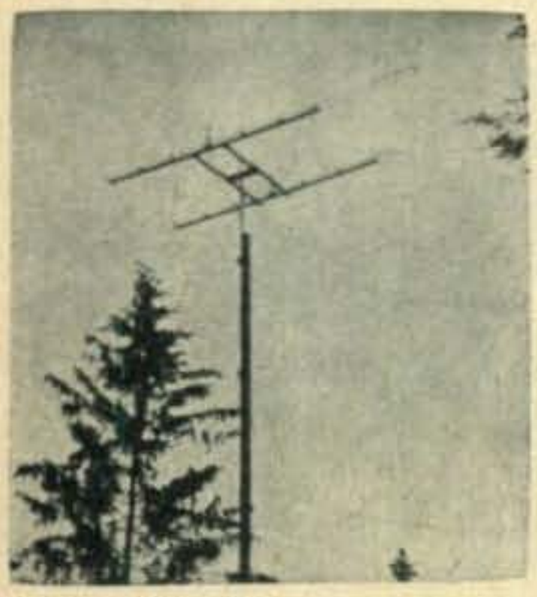
ALGERIA
All Band
FA8DA 200,499 425 40 119 B

ANGOLA
All Band
CR6AI 183,170 525 49 81 –
14 mc.
CR6AU 14,122 114 14 32 C

BELGIAN CONGO
All Band
OQ5CP 57,570 211 35 66 A
14 mc.
OQ5HI 27,838 172 21 41 B

CANARY IS.
All Band
EA8BK 13,200 112 12 28 –

ETHIOPIA
All Band
ET3AH 25,480 102 36 55 C



SM4BEC's 14-mc. Rotary.

ST. PIERRE & MIQUELON
14 mc.
FP8AP 5,111 247 7 12 –

VIRGIN IS.
All Band
KV4BK 45,900 335 22 38 B
14 mc.
KV4AA 42,642 365 23 46 D

[continued on page 109]

A 40-watt all band phone-cw transmitter. Ideal for portable work or for the beginner.

THE NEW RADIO Handbook

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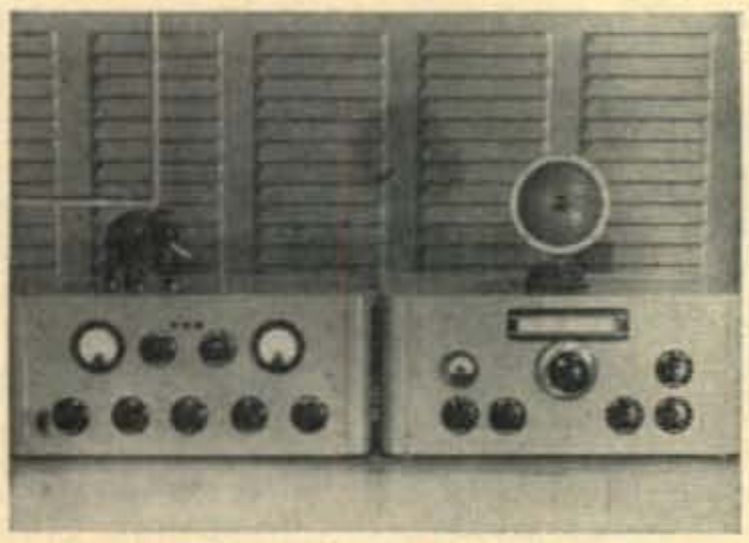
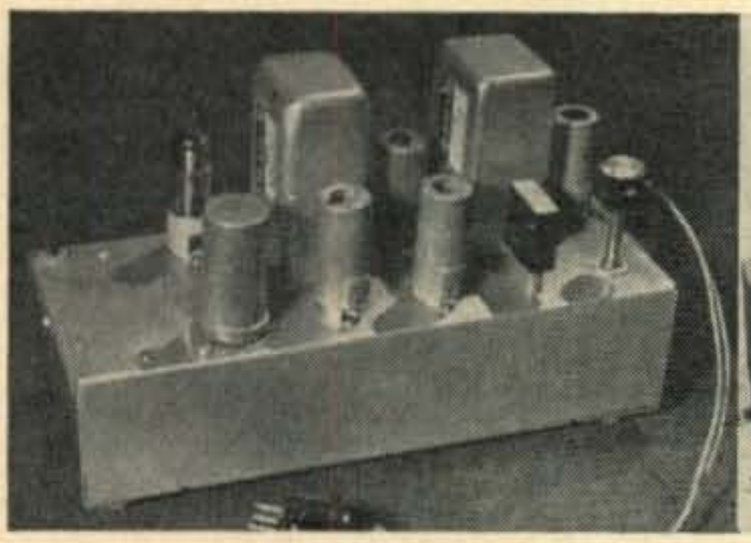


A complete 2 meter station. A sensitive superhet receiver and an efficient 20 watt phone transmitter.



The Universal Q-5'er . . . simple selectivity for your receiver. Eliminates adjacent channel QRM.

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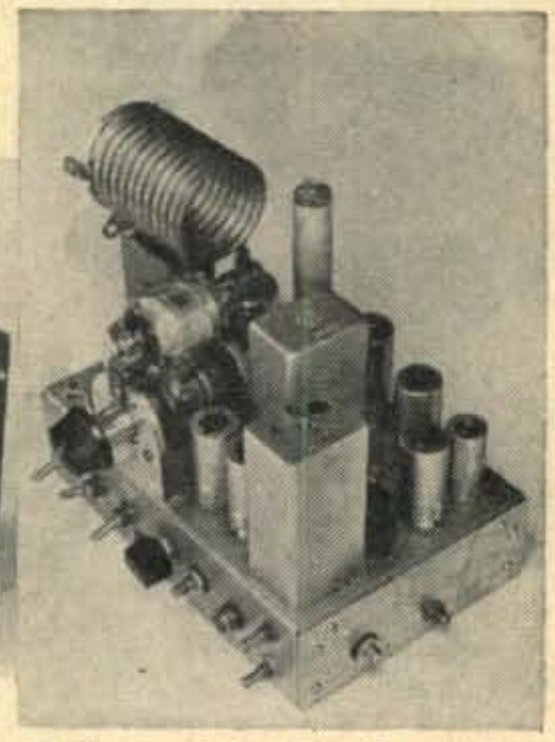

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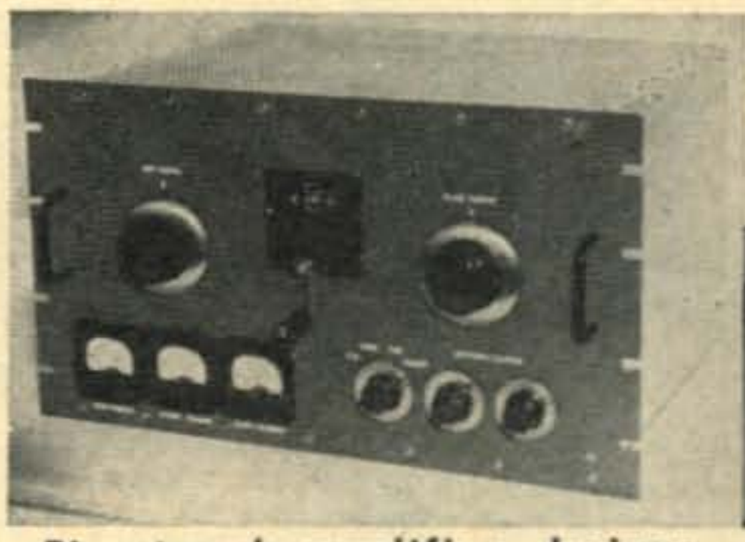

Pi-network amplifier designs. From a 6146 stage up to a 4-1000A all band unit, plus a new-design triode amplifier!

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YL

[*from page 62*]

National Convention

The Eighth National Amateur Radio Convention will be held July 6-8 at the Civic Auditorium in San Francisco, Calif. W6PCN, Peggy Detsch, chairman of the YL and SW activities, has added a few details to those reported in April *CQ*.

A special registration booth for licensed YLs is being planned by W6QMO, Jeri, and W6PIR, Mary Ellen. A hospitality room for YLs will be open at convention headquarters at the Hotel Whitcomb, across the street from the Civic Auditorium where most convention events will take place. The meeting for all licensed YLs will be presided over by W6CEE, Vada, past president of YLRL. Peggy says a special affair that should set a tradition for both YLs and SWs is in the works for the Friday night party. The AWTAR will start Saturday. Plans for a YL breakfast or brunch, luncheon or tea, fashion show, homemaking show, tours, souvenirs, etc. are all in the making. And of course there will be the exhibits, technical meetings, banquet, Wouff Hong, grand ball. This will be the first National Convention to be held in California; we know they'll do a terrific job. See you there?

YL Nets

Here is another new YL net to add to the list which appeared in January *CQ*. On 15 meters, it meets each Friday at 1 p.m. PST, 21,390 kc, with W6GGX as NCS.

A correction in the listing of the 75-meter Wed. phone net meeting at 9:00 a.m. PST, W6PJF NCS: alternate NCS is W6QGX, Harryette.

The RIYL Club has started a weekly CW net for R.I. YLs to be held Wed. at 1330 EST, 3743 kc, W1VXC as NCS. This is in addition to their Thurs. 2-meter phone net at 2000 EST with W1WPX as NCS.

Anyone interested in working for the LARK certificate (see above) is invited to join members of the Ladies' Amateur Radio Klub on their nets. The Fri. LARK NEST meets at 10 p.m. CST on 29,640 kc; W9LDK, Adeline, is mike moderator. The Thurs. LARK NEST meets at 2 p.m. CST at 3750 kc; W9SYX, Peggy, moderator.

Members of the Portland Roses hold a roundtable on 3870 kc on Tues. at 1300 PST, to which all are welcome.

Congratulations

To W3VLX, Lolly, secretary of YLRL, and her OM W3UKY, on the arrival of son Edward Alan on Dec. 30. . . . To W1ZUR, Anne, and OM W1ZUS, whose son Michael Shane was born seven weeks early but is doing nicely. . . . To W1ZWC and his SW on the arrival of

[*Continued on page 102*]

SAVE!...BARGAINS GALORE!...SAVE!

NEW LOW PRICES! — EFFECTIVE MAY 1st

COMMAND TRANSMITTERS & RECEIVERS—
ARC-5 and SCR-274 as available

FAMOUS "Q" 5'rs

EXC. CONDITION $10.95

Receivers, w/o dynamotors

R-23 oa BC-453, 190-550 Kc Exlt $10.95
R-25 Marine, 1.5-3 MC, used $5.95, new 6.95
R-26 or BC-454, 3-6 Mc, used $6.95, New 7.95
R-27 or BC-455, 6-9.1 Mc, used $4.95,, New 5.95
R-28, 100-156 Mc, as is, w/o tubes, 7.95, used w/tubes Exlt ..... 9.95 / 13.95
R-4/ARR-2,234-258 MC, as is w/o tubes, $2.95, w/tubes, used 3.95

Transmitters, w/o modulator or dynamotor

T-18 Marine, 2.1-3 Mc, as is, w/tubes, 3.95, used 4.95, boxed 5.95
T-19 or BC-696, 3-4 Mc, as is w/tubes, 6.95, used, 7.95, boxed 8.95
T-20 or BC-457, 4-5.3 Mc, as is w/tubes 2.95, used 3.95, boxed 5.95
T-21 or BC-458, 5.3-7 Mc, as is w/tubes, 2.95, used 3.95, boxed by depot 4.95
T-22 or BC-459, 7-9.1 Mc, as is w/tubes, 2.95, used 3.95, boxed 5.95
T-23, 100-156 Mc, as is, w/o tubes, 7.95, used, 9.95, new w/xtals 34.95
Special—one usable R-28 and T-23, both for 17.50

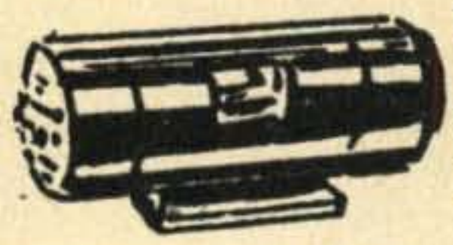
Misc. Command Equipment as available

Receiver dynamotors 28V, $1.00, 15 V new $4.95, used $ 3.95
BC-456 SC Mod w/tubes, new 4.95, used 3.95
MD-7 ARC-5 Pl Mod w/tubes Xlnt 7.95
28 v dynamotors inc w/above mods. Separately, w/o mod 3.00
Mounting Racks, used, 1.49, new 2.49
Receiver spinner knobs 69¢, ... 3/1.50
New 24 V Trans, ct at 12v, 2A 3.50
Plugs for rear of receiver 1.00
BC-442A Ant. Relay, cont. vacuum cap,50 MMFD 5KV Send-Receive relay, RF ammeter, used 2.45, new 2.95

110 VAC power supply for Receiver, cont. above trans & Selenium Rect. kit 8.95
Wired & Tested 12.95
Receiver Conversion kit; cont. schematic, BFO Sw, 25 K Pot, phone jack, and spinner knob, with instructions 1.95
1625 Tubes, for trans & mod, 50¢ 3/1.00
832A for VHF trans 8.00

Popular Dynamotor Specials

DM-34 Recvr. Dyna, 12 V in 220 @ 80 ma Out. new 4.95
DM-36 Same as above, 28 V. new 4.95
either of above. used 3.95



PE-101C, Transmitter, 12 or 24 v input, 500 v at 200 Ma out, (300 v 6v in) new 7.95
DM-42, 12 V in, out 1000 and 500, ea at 215 Ma, used 12.95
DM-35, 12V in, 600 at 200 Ma out, New, 12.95 Used 9.95
Wincharger Dyna. 12 v in 440 @ 220 MA Out. new 12.95
BD-69 Rec. Dyna, 14 v in, 220 at 80 Ma out, new 9.95
PE-73, 24 v in, 1000 at 350 Ma out New 8.95, used 6.95
PE-94, 28 v in, for 522, 300 at 250 Ma, 150 bias, and 12 V 10 A, new 4.95

Triple Geared Genemotor, for power reduction, barbecues, etc. 18 v in, 450 at 60 Ma out, plus out pwr shafts at 180, 26, and 7 RI'M, new 3.95
RK-65 Tetrodes, 500 watts each, 6 watts drive, special, 9.95 each, 2 for 15.95

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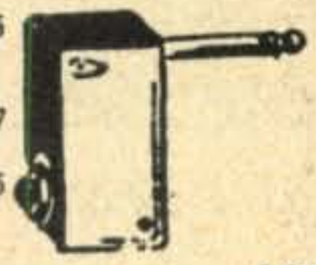
METERS. ALL NEW, 2" SQUARE

0-2 Ma	0-200 Ma
0-5 Ma	0-300 Ma
0-15 Ma	0-500 Ma
0-50 Ma	0-20 VDC
0-100 Ma	0-40 VDC
	0-300 VDC

3.29 each, Special, 3 for 9.00

Filament Transformer—240 VAC, Primary 5 VAC, 30 A, 15 KV insulation when used on 120 VAC, gives 2½ VAC for 866's or 249's ..... Brand New $ 7.95
Heavy Duty Collins choke, 300 Ma, can take 500 Ma peaks, new 3.95
249C, 5000 volts, new, each 5.95
Bleeder resistors, 50 K 100 W, new 1.95
Special, all above, including 2 tubes for 500 Ma (50 lbs) 19.95
Transmitter Power Supply Kit contains chassis, 2 transformers, 2 tubes, 2 sets filters and bleeders, gives 500 VDC and 250 VDC, value of parts 23.34 Special $15.95
Weight 22 lbs.
Mobile Microphones, newly assembled, W.E. D173015 similar to the TC-128, push-to-talk switch, 3 cond. 5' curl, cord, new 3.95
Brand New Headphones, your choice of HS-23, 2000 ohms, or HS-33, 600 ohms, complete with brand new rubber cushions 3.95

Used HS-23, w/o cushions 1.95
New small cushions, pr. ..... .49
Used chamois cushions, pr ..... .49
New lg rubber cushions, pr. ..... .29
Brand new Impedance matching transformer, plug in, 2000 ohms to 600 ohms, takes std plug, boxed 69¢ each, 3 for 1.95
CD-307A cords, has JK-26 on one end for phones, std plug other end brand new, boxed ..... .97
Brand New J-38 Code Keys, for sending CW with your transmitter 1.45



Build your Modulator, Input trans., 1.50, driver, 2.50, mod. trans. 2.95, 2 new 1625 tubes, value 7.70, all for 6.95
Stewart Warner Ammeter, 60-0-60 Amps, brand new, 95¢, 6 for 5.00
Phone-CW Filters, 1020 cycles, new, FL-5, 69¢ FL-8 with switch 1.89
GP-7 transmitter with all tubes and 80 meter coil unit only 13.95
Less tubes and coil unit 7.95
BC-375, 100 w CW or phone transmitter, less tuning units, contains multiturn coil used in KW pi network final, w/o tuning units, but with tubes 12.95

TU-7, 4.5-6.2 Mc; TU-8, 6.2-7.7 Mc; TU-9, 7.7-10 Mc; TU-10 10-12.5 Mc; TU-26, 200-500 Kc, choice, used, each 2.29
T-30 Throat Mikes, used, 5 for 1.00
3' Mast Sections, MS-49 thru 52, 50¢ each. 53 and above, 75¢ each. Special, 1 each MS-49 thru 54, makes 18' vertical 2.95
Variable Antenna Matcher, 100 w. rating in the BC-375, ok for 1 Kw in a Pi network 8.95
MN-26C direction finding Equipment
MN-26C Receiver w. dyna 10.95
MN-20E Loop 4.95
MN-52H Az Cont Box 2.95
All above new, special, 1 each for 17.95

Antenna Insulators, Bendix MT-48C, plated end caps, new, 15¢ each, 10 for 1.25
Control Box w/5 Ma S meter, special ... .98
Antenna Reels, new 28VDC, ¼ Hp, w/Gear box 2.95
SCR-522, exc. condition. Contains Receiver, Transmitter, Modulator, tubes, tunes 100-156 MC, covers 2 M w/o modification 34.50
New transmitters, GF-11 for 12 volts, or GF-12 for 24 volts, with tubes and built in modulator—less tuning unit, GF-11, $6.95, ... GF-12 5.95
Tuning Unit for above 1.95
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SAM'S SURPLUS, 1306 Bond St., Los Angeles 15, California

[*from page 100*]

twins—"W1"GIRL/BOY—on Jan. 31. . . . To KN9BAO, Bettie, who had a Valentine evening wedding Feb. 14 at home (and on 3910 kc—Ind. net freq.). Her mother is W9JXO, Thelma. . . . To W8SPU, Helen, and OM, W8QOV, who celebrated their silver wedding anniversary Jan. 9.

After mentioning here last month that Janet and Janice Robidoux, WØQXF and WØQXA, were the only YL twin Hams we knew about, we met twin sisters W3URT-URS, June and Doris Schachterle of Norristown, Pa. on the 20-meter YL net.

Your column editor is pleased to have an article on Pueblo Indian bread making in the May issue of *New Mexico Magazine*. This is their special vacation issue with many pages of color photos. Anyone interested in the W5RZJ article or in learning more about our "Land of Enchantment" may obtain copies (35¢ each) by writing *New Mexico Magazine*, State Capitol, Santa Fe, N. M.

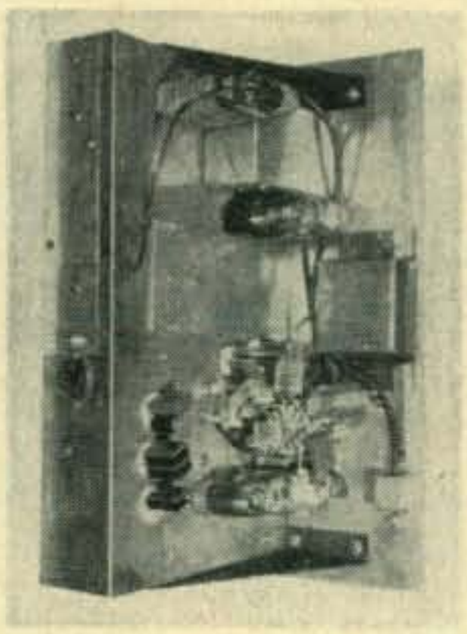
33, Louisa, W5RZJ

Hi-Level Mixer

[*from page 55*]

Additional Notes

In addition to the r-f filtering and shielding shown, the mixer unit was completely enclosed—top and bottom—with aluminum sheathing obtained from a good hardware store. Small ventilating holes were drilled in it above and below the 807W stage for air circulation. With the built-in low-pass filter, no TVI was evidenced on any of the channels in the author's two TV sets. To make this test, the mixer was operated at its maximum linear capabilities into a dummy load, tightly coupled to the TV transmission

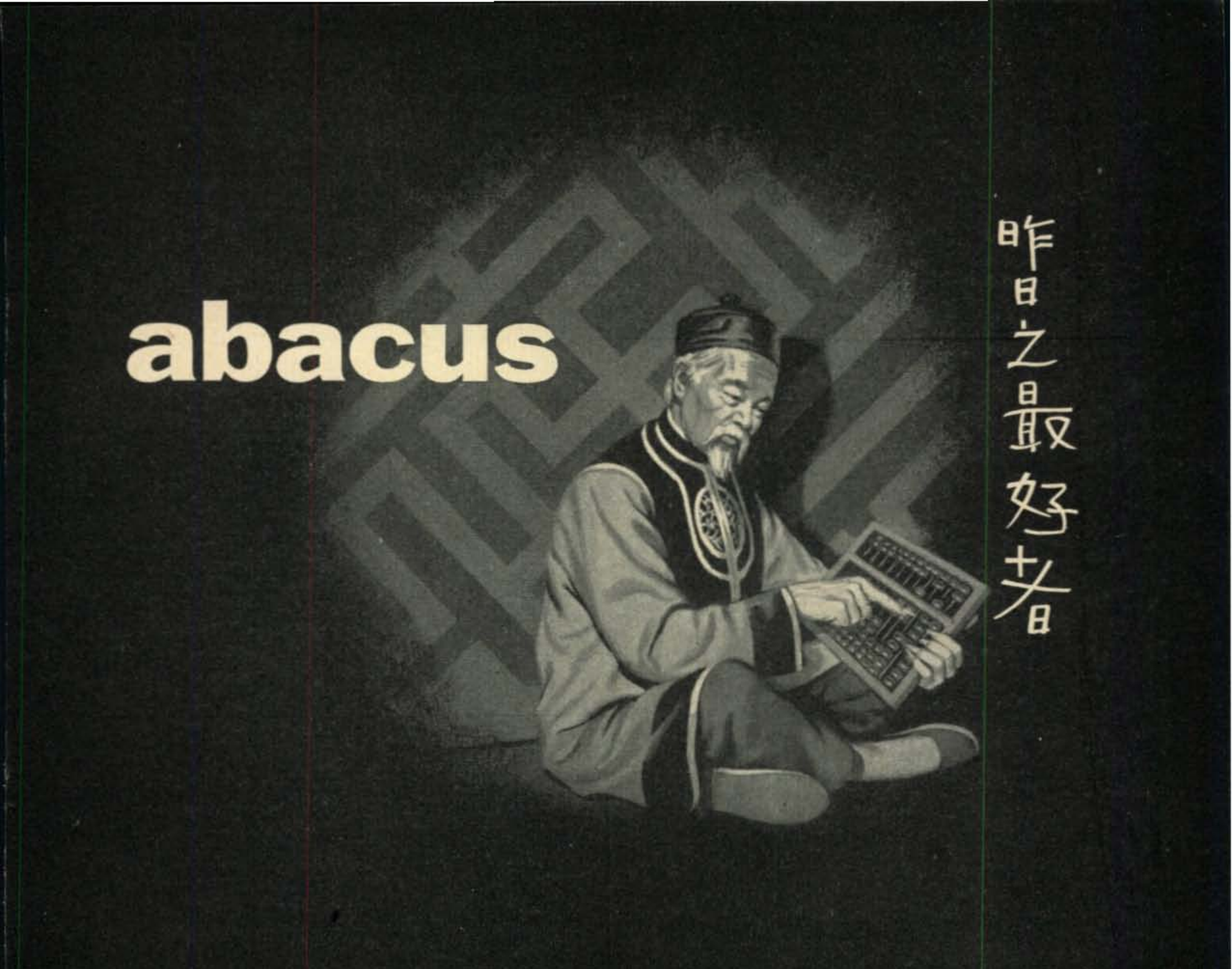


Top chassis view of the Mixer. Right center are the 807W mixer tube and 7C5 oscillator. To the left of the 807W is the mixer tank switch assembly. On the right rear edge of the chassis are the oscillator crystals and ceramic sockets. To the far front left is the shielded low-pass filter, with the regulator tubes adjacent.

line. Neither with the mixer driving the final amplifier (a pair of 813's in push-pull) was TVI in evidence.

An accurate indication of r-f output could not be obtained, but from the tests made it appeared to be about 15 watts when operating according to the conditions listed in *Table II*, cloumn 3. This should be ample to drive most linear final amplifiers. A buffer amplifier could

[*Continued on page 104*]



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[from page 102]

easily be added if additional power output is needed.

The 11-meter band may be added by choosing a crystal frequency of 23.225 Mc and taking the sum of the two mixing frequencies. An additional slug-tuned coil, similar to *L4*, would have to be added to switch *SA2*. The final tuning condenser, in the 10-meter position, tunes approximately five megacycles and therefore no additional coil and condenser would be needed here. Similarly, with a limited range exciter-v.f.o., additional 10-meter frequencies may be covered with the additional selection of lower or higher crystal frequencies and the inclusion of a *separate* oscillator plate coils on switch *SA2*. In all probability *L4* would be detuned too far, resulting in little or no oscillation, if used to resonate with more than one crystal. Plenty of switch and chassis space is available for this purpose.

Labeling of the front panel was the last operation performed, and I might add, the easiest of them all. The decals used are "Tekni-Cals," and give a fine professional appearance to the panel.

The author has been using this Hi-Level Mixer on 40 Meters and above for almost two years, with very good success. No trouble has developed to date, nor is there any anticipated. No matter what type of mixer or heterodyning unit you employ, *give the higher frequency bands a try!* It's a pleasure to get away from those 75-meter multiple round table discussions where it's difficult to get a word in edgewise. ■

1. *CQ's Single Sideband Techniques* by Jack N. Brown.
2. Low-pass Filter, page 509, 1953 *Handbook*.

New Radio Store

Electronic Supply of 61 N. E. 9th St., Miami, Fla., has opened a branch at 413 New Haven Ave., Melbourne, Fla., on April 15th to service the many hams in that area.

Central Kansas Hamfest

The Annual Picnic of the Central Kansas Radio Club will be held in Kenwood Park, Salina, Kansas, June 3, with registration at the usual 75c. The order of the day will include a basket dinner, prizes, transmitter hunts, and activities for the ladies and children.

Birminghamfest

The Birmingham Amateur Radio Club will hold its Annual Hamfest at the State Fair Grounds, Birmingham, Alabama, Sunday May 6, 1956. For further information and tickets write P.O. Box 603, Birmingham, Alabama.

Parts List for Three Tubes: Two-Twenty (p. 26, April CQ)

L1—14T on ⅜" dia. brass slug-tuned form #18 wire
L2—7T on ⅜" dia. brass slug-tuned form #18 wire
L3—2½" long loop ⅝" wide #18 wire
L4—1¼" long loop ⅝" wide #18 wire spaced ⅛" under L3
L5—3" long loop ¾" wide #18 wire
L6—2½" long loop ¾" wide #18 wire spaced ⅛" above L5
RFC3 & 4—20T ⅛" dia. #18 wire
RFC1 & 2—2½mh chokes
Resistors are all ½ watt.

Flexiblizing Meters

[*from page 37*]

test meter "A" is in the maximum d.c. ma. position and the 2000 ohm potentiometer inserts maximum resistance into the circuit. This will prevent meter damage from overloads.

Procedure

Reduce potentiometer until meter "X" reads full scale. Reduce the d.c. ma. scale on test meter "A" to a scale you can read with accuracy. This is the current in the circuit and is the basic movement of meter "X." Do not disassemble the test circuit since it will be used to calibrate the new shunt.

Now that the basic movement is known, you can change the meter to the range wanted by winding a new shunt. This shunt should have enough resistance so that the full scale deflection will correspond, in our example, to a current of 100 milliamperes.

Suitable shunts can be made from the peaking coils used in television receivers or from one section of a pi wound r-f choke coil. The use of these coils permits controlled adjustment of resistance within fine limits. The cut and try method of finding the proper number of turns and resistance is a reasonably fast method of obtaining the proper shunt value.

Shunt Procedure

First: Connect new shunt coil across the "X" meter outside terminals.

Second: Use the test circuit as before and reduce potentiometer until a full scale reading is secured on the "X" meter.

Third: Read the current flowing in the circuit on the test meter "A." If it is less than 100 milliamperes (and it probably will be), remove turns from the shunt until a full scale deflection on "X" meter corresponds to a reading of 100 mils on the test meter.

Permanently solder the new shunt to the external meter terminals. Check the calibration again, then apply acrylic spray on the shunt for protection.

In this example the full scale deflection of the meter is the original scale divided by 5. The panel lettering can be labelled X/5. Simple. ■

Oregon Hamfest

The Valley Radio Club of Eugene will be host to the Oregon Amateur Radio Association 19th Annual Convention May 5th and 6th. About five hundred amateurs and their families are expected to attend from all over the northwest — with featured speakers, demonstrations, contests, prizes, mobile hunts, special group breakfasts, swapfest, banquet and lots of fun for all.

Admission includes main banquet and will be as follows: Amateurs Pre-registration (Before April 15th) $7.50, Amateurs Registration $8.00, Non-Hams $4.50.

Already confirmed is a talk on the mechanical filter by a member of the Collins Company. Other prominent speakers are being arranged.

All hams regardless of QTH or type of activity are cordially invited to attend. For reservations and registrations contact:

OARA Convention Headquarters, 828 Olive St., Eugene, Oregon.

(photo by M. N. Echenagucia, St. Thomas, V. I.)

Amateur Radio in 3-D !

Above, Dick Spenceley, KV4AA, well-known DX op and DX Editor of *CQ*, checks the *CQ*-Hammond World Globe to see just where it is he's talking to to find the exact location of his DX contact.

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CQ-5

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[from page 98]

ICELAND
All Band

TF3AB	21,546	176	17	46	B
TF3NA	128	11	5	11	–

ITALY
All Band

IIALU	96,170	328	46	117	–
ITITAI	30,362	200	23	71	C
IIBLF	23,062	168	19	39	–
IIER	6,394	61	18	28	B
21 mc.					
ITIZWS	2,208	50	8	24	–
14 mc.					
IIBUQ	13,888	169	14	42	–

NETHERLANDS
All Band

PAØUN	429,488	646	78	194	B
PAØSPR	205,588	440	60	146	B
PAØTAU	187,533	426	60	141	–
PAØAGA	56,280	298	28	92	–
PAØVB	41,625	206	33	78	C
PAØWAC	13,600	120	21	39	–
PAØHP	6,985	109	12	43	–
PAØNN	4,488	54	17	27	–
PAØSNG	1,240	36	10	21	B
21 mc.					
PAØKX	32,092	164	24	47	–
PAØQT	24,614	157	18	44	–
PAØMAR	1,870	41	7	10	–
14 mc.					
PAØULA	18,904	131	21	47	C
PAØZL	17,688	157	21	46	–
PAØHJK	12,972	137	14	32	–
PAØUW	10,488	112	17	40	–
PAØBRS	2,407	53	8	21	–
PAØPLM	576	32	4	14	–
7 mc.					
PAØNIC	7,875	149	10	35	–
PAØOI	3,996	76	7	29	–
3.5 mc.					
PAØTA	4,030	128	5	26	B
PAØLV	2,425	96	4	21	–
PAØWKL	1,320	67	2	18	B

NORTHERN IRELAND
All Band

GI3IVJ	70,782	301	36	105	C

NORWAY
All Band

LA6U	28,227	181	29	68	A
LA2Q	4,410	90	10	35	–
LA2MA	4,365	89	10	35	–
14 mc.					
LA5DB	1,575	47	6	19	–

POLAND
All Band

SP5FM	85,635	357	40	125	C
SP3PK	68,527	241	44	95	B
SP5AR	53,594	247	36	91	C
SP1KAA	2,475	87	4	21	–
SP8CK	1,196	42	6	20	A
21 mc.					
SP6WH	4,147	59	11	18	A
14 mc.					
SP5KAB	17,052	242	13	36	D
SP3AK	3,552	68	12	29	B
7 mc.					
SP3PD	4,902	92	10	33	B
3.5 mc.					
SP3KAO	2,706	135	3	19	B

PORTUGAL
14 mc.

CTICO	45,710	309	22	48	–

ROUMANIA
All Band

YO3RF	150,696	590	50	132	B
YO3VA	7,592	124	11	41	A

SAARLAND
All Band

9S4AX	31,719	167	33	64	B

SPAIN
All Band

EA1AB	113,316	400	38	95	C
EA3GF	50,078	276	26	47	C
EA1CP	41,376	243	27	69	–
EA3CY	38,200	204	33	67	–
EA2CK	7,980	72	18	39	B
EA5EF	4,464	65	11	37	–
EA2CR	3,422	65	8	21	–
EA1FQ	408	21	5	12	–
14 mc.					
EA4CR	41,470	319	20	45	C

SWEDEN
All Band

SM5DW	115,391	312	47	126	C
SM5AQW	113,664	453	41	107	C
SM6ID	105,742	316	45	137	B
SM6BDS	28,662	193	25	77	A
SM6DA	25,017	206	18	75	B
SM5CCE	21,312	228	17	55	B
SM3AF	9,570	128	15	51	–
SM5UQ	8,468	130	12	46	B
SM4AOK	7,797	67	24	45	–
SM7AOO	6,900	69	18	42	B
SM5LL	6,840	42	27	33	–
SM5BRO	4,136	38	20	27	–
SM5BFR	1,300	30	8	17	–
SM2VP	1,092	34	6	7	C
SM6PF	42	4	3	4	–
28 mc.					
SM5CO	3,135	38	11	22	C
SM7QY	425	17	9	16	C
21 mc.					
SM7BVO	24,064	188	16	31	C
SM5KV	1,392	30	8	21	A
SM6VY	432	14	6	12	B
SM5HH	378	14	5	4	B
14 mc.					
SM5IZ	37,596	224	23	55	–
SM4BEC	33,245	226	21	40	–
SM3ACP	13,446	191	15	39	–
SM2ALU	10,783	136	12	29	–
SM6AMR	6,875	145	8	27	–
SM7BY	665	21	7	12	B
SL5CN	144	8	3	6	B
7 mc.					
SM6APB	2,822	73	7	27	C
SM5CXF	168	12	3	9	B
SM4CVH	24	5	2	4	A
3.5 mc.					
SM6JY	1,406	75	2	17	C
SM5CZD	84	12	2	5	A
SM7CAB	99	11	2	7	B

SWITZERLAND
All Band

HB9NL	328,735	615	66	149	C
HB9MO	105,968	284	56	123	C
HB9NW	15,183	163	17	46	B
14 mc.					
HB9QR	67,890	303	29	64	B
7 mc.					
HB9UB	3,016	100	5	24	B
3.5 mc.					
HB9KC	1,924	73	4	22	B
HB9DB	72	7	3	6	B

TRIESTE
All Band

IIBNU/T	24,070	184	23	60	B
14 mc.					
IIYCZ/T	5,890	119	8	30	B

WALES
All Band

GW3HJR	93,167	336	43	108	B
GW3HXT	21,534	160	18	56	–

YUGOSLAVIA
7 mc.

YU2HA	11,457	192	12	45	–
YU1AG	6,888	142	9	33	B

OCEANIA

AUSTRALIA
All Band

VK2GW	152,456	447	45	73	B
VK2EO	77,004	290	32	61	–
VK2PV	42,394	167	37	57	B
VK2ADE	17,780	91	25	45	B
VK3CX	7,224	64	18	24	–
VK4CG	4,466	53	14	15	–
VK6RU	66,992	237	40	66	–

CAROLINES IS., WESTERN
21 mc.

KC6CG	59,730	326	24	42	C

HAWAII
All Band

KH6IJ	395,784	961	64	74	D
KH6PM	186,960	522	59	64	C
KH6SP	110,522	537	39	34	–
KH6MG	18,305	177	18	17	B

MARIANAS IS.
All Band

KG6AGC	21,508	115	38	38	B

NEW CALEDONIA
All Band

FK8AH	22,889	184	22	25	–
FK8AO	8,640	84	22	18	B

NEW ZEALAND
All Band

ZL1BY	194,680	434	62	93	B
ZL1MQ	107,262	376	47	54	B
ZL2GS	82,610	263	46	64	B
ZL1MT	9,240	75	29	27	A
14 mc.					
ZL4CK	16,203	167	14	19	B
7 mc.					
ZL3LL	7,511	93	12	17	B

PHILIPPINES
All Band

DU7SV	126,452	428	47	54	C

SOUTH AMERICA

ARGENTINA
14 mc.

LU3HR	61,848	300	25	47	–
LU7AS	39,846	236	22	36	C
LU5ABL	7,476	66	19	23	C
LU2ZV	5,909	113	9	10	–
LU1ZV	3,540	86	6	9	–

SM5DW—Rolf was the All-Band CW winner for Sweden. He ran 500w to a pair of 813s, AR-88 receiver with preselector and selectoject. Three Vee-beams and a couple of Ground Planes gave him coverage in all directions.

BRAZIL
All Band

PY2NX	77,913	272	40	59	–
PY1RW	51,027	241	30	43	–
PY3QX	50,630	200	39	46	–
PY1ANR	18,183	115	21	36	–
21 mc.					
PY4AO	14,392	90	18	38	–
PY1AZO	8,804	98	13	18	–
14 mc.					
PY7AN	98,687	405	28	55	–
PY2KD	33,320	207	21	35	B
PY2AS	20,451	137	19	32	B
PY5VF	15,228	118	19	28	–
PY8MO	10,800	158	10	14	–
PY2BBO	1,950	53	7	6	–
PY1NAN	1,617	30	15	6	B
PY5TH	1,386	44	7	7	–
PY2BIG	1,355	36	8	7	–
7 mc.					
PY2BNX	901	20	7	10	B

CHILE
All Band

CE4AD	94,265	384	40	45	C
CE6AB	39,952	210	41	47	–

NETHERLANDS, WEST INDIES
All Band

PJ2AA	97,704	280	42	76	C

PERU
14 mc.

OA4J	5,175	88	13	10	–

URUGUAY
All Band

CX6CM	28,044	176	25	32	B
CX1FB	21,942	142	29	24	–
14 mc.					
CX6AD	6,641	90	14	15	B
CX2AM	5,238	73	12	15	–
CX8AO	3,051	48	14	13	B
CX5CO	2,610	52	10	8	B
CX7CO	252	15	7	7	–

VENEZUELA
All Band

YV5BJ	35,108	182	30	37	–

C W Section
Multi-Operator

NORTH AMERICA

UNITED STATES
All Band

W1MX	64,000	189	41	87	–
(Club Station)					
K2DBC	7,800	64	18	32	B
(K2DBC–W2KTG)					
W3RYX	8,184	60	26	40	D
(W3RYX–W3YIV)					
W6AM	299,472	446	99	173	D
(W6AM–W6BXL–W6KPC–W6YMD)					
W6DFY	227,487	375	98	149	D
(W6DFY–W6GHM–W6ILP)					
W6EEK	166,192	313	82	126	–
(W6EEK–W6LDJ–W6NKU)					
W6NJU	144,410	284	74	96	C
(W6NJU–W6HJK)					
K6EVR	21,948	110	46	47	C
(K6EVR–K6ELX)					
K6AQP	13,950	88	37	38	D
(K6AQP–W6JFV)					
W9AVJ	272,073	381	95	172	D
(W9GVZ–W9NZM–W9PKW)					
W9IOP	219,515	378	72	143	D
(W9IOP–W9VW)					
W9OBV	14,703	97	39	48	–
(Club Station)					
21 mc.					
K2IEG	5,576	56	17	24	B
(K2IEG–K2IXP)					
K6IQF	492	22	6	6	B
(K6IQF–W6QXH)					
14 mc.					
W6CUQ	35,956	167	29	60	D
(W6CUQ–W6MUR)					
W8VPC	3,570	49	17	17	C
(W8VPC–W8DJN–W8TJQ)					
7 mc.					
W6MUR	4,674	60	19	19	D
(W6MUR–W6CUQ)					

CANADA
All Band

VE4RO	113,022	261	73	109	–
(VE4RO–VE4XO–VE4LD)					
14 mc.					
VE2ADX	7,500	112	19	31	C
(Club Station)					

ASIA

JAPAN
All Band

KA8AB	272,718	667	50	89	D
(W6DUS–W1TTA)					

EUROPE

CZECHOSLOVAKIA
All Band

OK1KTI	166,064	444	56	138	B
(Club Station)					
OK3KEE	22,672	140	30	74	C
(Club Station)					
OK1KKH	21,627	150	23	66	B
(Club Station)					

ENGLAND
14 mc.

G2BOZ	51,850	335	25	60	B
(G2BOZ–G3HCT–W3HDA)					

[continued on page 121]

W3VKD—Thats W3LMM at the Key. He made 8th highest in the World in the CW Section. The boys were second highest in the multi-operator 'fone section. They ran a KW to 6-el beam on 10, 3-el on 15 and 6-el (thats right, 6 elements) on 20.

TUNING FORK

[*from page 29*]

bridge source. With known frequency the "Q" and dissipation factor dials can be made direct-reading, a great convenience.

One of the author's bridges determines capacity in terms of frequency and resistance. Resistors can be inexpensively purchased giving 1/10 percent accuracy. Use of the fork oscillator gave similar accuracy in the measurement of condensers. This 1000-cycle oscillator used the General Radio fork previously mentioned and the vibrating portions and exciting coils were mounted on a small square of duralumin. This plate was originally provided with banana plugs so that a series of plates, bearing forks of different frequencies, could be plugged into a single amplifier. With the development of the one-tube circuit there was little economy in this scheme so the plug-in feature was abandoned in favor of giving each fork its own amplifier. The photo will show the reader that the left-hand unit of the two is the 1000-cycle mechanical oscillator.

Since the bridge will always be operated close to balance it was only necessary to make *one* of the arms variable for amplitude setting. A full turn of this control will produce a hundred-fold increase in output and a *quarter-cycle* variation in frequency! Except at large unbalances the lamps show no visible light.

When the V.H.F. Teletype Society was founded in 1946 an audio frequency standardizing service had to be established in order that all amateurs using teletypewriters could intercommunicate. Inaccuracies in the output frequencies of the Teletype oscillators or errors in the resonant frequencies of the sharply-tuned receiving filters would make satisfactory communication unlikely. W2BFD provided the RTTY standard frequency tuning-fork installation whose accurate output the Society made available via radio transmission and also recordings for tape, wire or disc playback.

The smaller tuning-fork, in the photograph, was built from a 440-cycle musical "A" fork which was filed down to 425 cycles and compared with WWV audio tones, using a series of harmonic generators and frequency dividers to develop the correct comparison tone from the (at that time) 1000-cycle transmissions of WWV. This 425-cycle fork has no temperature compensation yet, under all conditions of room heating the year around, the total frequency error has never reached 1/10 cycle in the numerous frequency checks made over several years. For amateur work this order of accuracy should be entirely sufficient. It represents an accuracy of better than 1/40 of one percent! The bridge circuit compensates for changes in line voltage, aging of tubes, etc.

Resonating the Coils

The higher the gain of the amplifier, the more constant will be the amplitude regulation and the more rapidly will fork amplitude build

up on starting. As a very effective method of raising gain, and at the same time increasing the purity of the waveform, the pickup coils, feeding the input of the amplifier, are tuned with a fixed condenser to resonance with the fork's natural frequency. Gains of from 3 to 10 times are possible by this trick. No resonating condenser is employed on the pair of exciting coils because they are heavily loaded by the resistance bridge and do not exhibit resonance. The proper value of resonating condenser is determined with the bridge permanently unbalanced by short-circuiting the lamps and the gain reduced by means of a volume control temporarily connected in the second stage grid. As resonance is approached the gain control can be backed down. The condenser requiring the lowest setting of the volume control is the correct one. The exact value cannot be specified because different coil inductances and different pole-piece-to-fork airgaps will affect it. The volume control should then be removed as the bridge balance control will set the level thereafter.

Construction

The construction of the fork and driving units has been left to the last. It is highly important that the fork be fastened rigidly with respect to the pickup and driving coils. Unless the handle of the fork is held by a massive block its "Q" and reliability will be diminished. In the photograph it will be seen that the General Radio 1000-cycle fork is clamped with screws to a rectangular metal block. This was part of the original G.R. setup and was not modified. The musical tuning fork was a horse of a different color as it had no holes through the stem or handle for properly clamping it. At this point we publicly vote our thanks that W2BFD's Welsh ancestor was a Scotchman. A little box had been slowly filling up with tiny scraps of solder, too small to hold without burning the fingers. Instead of melting it down to form an "ingot" of plumbers' bar-solder (hoot mon!) it was dedicated to clamp the fork. A bottle of gin was purchased for no other reason (believe us) than to secure the little bakelite "jigger" or measuring cup that serves also as a screw-on cap on the bottle. Setting the cup down, open end up, the handle of the tuning fork was passed through two holes drilled diametrically apart about half an inch up from the bottom of the cup. After making sure that the tines of the fork lay in a horizontal plane molten solder was poured in, sufficient to cover the handle to a depth of a half inch and allowed to harden, whereupon the bakelite cup was cracked off and two mounting holes drilled down through the "ingot" for clamping to the chassis plate.

The pickup and driving coils, as can be seen, are constructed of the complete "innards" of a cheap pair of 2000-ohm headphones. They are bolted to a couple of pieces of 3/4" angle

[*continued next page*]

[*from preceding page*]

iron (or aluminum) about two inches long. They should be fastened to the angles at such a height that the tines approach the center of the pole-pieces. An airgap of from 1/32 to 1/16 inch should be about right, depending on the strength of the permanent magnets. The connections to one set of coils may have to be reversed in order to obtain *regenerative* feedback. It may also be advisable to try reversing the polarity of the permanent magnet on one set of coils.

It is extremely easy to adjust the final frequency of the fork. To lower the frequency the tines are made longer by filing away metal in the crotch between the tines with a rat-tailed file. To raise frequency the tines are shortened by filing the tips with a flat file, taking care to give each tine equal treatment. It is best to remove the fork portion from the magnet assembly so that the filings are not collected on the pole-pieces and magnets.

Changing the load on the unit has negligible effect on the amplitude of the output and results in no detectable frequency variation. However, when the load has become too great for the bridge to further compensate, the oscillations will abruptly cease. A very fine square wave results from turning the bridge balance control full-on. Usable amounts of energy are to be had at harmonics as high as the 20th, which can be separated from energy at other harmonics through the use of tuned circuits or filters. Thus the 425-cycle fork can supply output directly at 2125 and 2975 cycles, the mark and space frequencies of frequency-shift Teletype equipment.

An interesting use for the fork and coil assembly, other than as an oscillator, is as a sharply-tuned receiving filter. The frequency fed into one set of coils must be within *one cycle* of the fork's natural period for any appreciable vibration to take place. When this is the case a voltage is generated in the other set of coils by the vibration of the fork and this may be considered the output voltage. Motorola has made good use of this extreme selectivity in their "Vibrasender" and "Vibrasponder" equipment for selective mobile calling. A fork used in this manner is so sharp in its response that it is practically a necessity to use another fork as the source of the tone for it. A number of interesting possibilities open for us in the employment of this principle for remote control and autocall.

The mounting method is the universal unit-construction, standardized by W2BFD to make life simple.[3] One of a score of similar "universal" power supplies is shown between the two fork units. A unit similar to this setup would be excellent for two-tone tests of single sideband equipment and intermodulation checks on high fidelity audio gear. It is the "last word" as a generator to excite Maxwell, Owen or Schering bridges. ■

3. Unit Construction, *CQ*, Aug. 1955, Page 23.

SINGLE SIDEBAND TECHNIQUES

by Jack N. Brown, W3SHY

This is the latest addition to the *"CQ* Technical Series," Over 2000 Hams took advantage of our pre-publication offer and are now probably sitting back enjoying Jack's breezy style of telling the full story of SSB. This book is a continuation of Jack's series "Getting Started on Single Sideband." In this book he goes on to describe two different SSB transmitters and several items of useful test equipment, and throws in a good background on how to keep your SSB signal clean. This is the only book of its kind on the market. Some may try last-minute imitations, but they'll never equal it.

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(See Page 119 for subscription blank)

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[*VHF leakage from page 87*]

Lockport, New York: A contribution from the "Empire" state" and Larry (W2ALR):

> "Got my new semi-portable rig just about all done, of course there are a few bugs yet but at last the end is in sight. Runs about 70 watts into a AX9903 with 2E26's for modulators; with a six tube superhet (14-18 Mcs) bfo, anl, and squelch. All this in a box about the same size as the typical low frequency 100 watt commercial transmitter." (*Let's hear more as it progresses Larry, sounds interesting.*)

Oil City, Pennsylvania: Joe (W3LST) from the "Keystone" state emits with:

> "After an absence of several years I'm getting back on Two Meters, rig is a pair of 4X150's at 600 watts, AM and CW. Antenna is twenty elements. Signal will definitely be on by May 1st at the very latest." *(Glad to hear you're with us again, Joe, and that Oil City will positively be heard from.)*

Sarasota, Florida: The "Flower" state and Larry Loper (W4WHF) reports:

> "This is to report two-meter activity on the west coast of Florida. *(Attention, WN1GKE!)* We have: W4's BU, TWD, and ETI with Sonar equipment; W4's WHF, LMT, and DSH with Gonset Communicators; and W4QEA with an SCR 522. We have been talking to KN4EAC and WN4CZZ/4 in St. Petersburg, and to W4MIG and W4LAW in Tampa. W1GJO/4, Fort Myers with 350 watts just joined us.
>
> "Starting last night about 7:30 P.M., E.S.T. (February 26) W1GJO/4 contacted CO2CT in Havana, Cuba. His contact was followed by W4CCR and W4QEA working CO2CT after which he was lost. However at 10:05 P.M., E.S.T., CO2CT's signal was 5 by 8 to 9. He was using CW, all the rest use phone. Excitement is running high in this area now *(I should hope so)* with other fellows working on gear to get on. Sarasota schedule is every night starting at 7:30 P.M., E.S.T. Operating frequency is 145.62 Mc." *(There's good news tonight boys, c'mon let's go. Hi, Cuba, here we come.)*

South Africa: From that far-away country and Don (W1AZK) we received a post-card with the news that he's checking up on VHF activity in that country, and that he'll be back to the New Hampshire hills about May 1st.

> *(Fine business, Don, be sure to make a sked with someone in preparation for your return.)*

Drayton Plains, Michigan: A note from the "Wolverine" state and Roger (W8URO):

> "I'm sitting here listening to this dead band, 144 Mc. *(HUH?)* The rig is a 522 at about 15 watts to a 4 element at about thirty feet. The receiver is a crystal converter (6CB6-12AT7-6J6) into an S-76. I'll have a sixteen-element collinear at about 45 feet soon.
>
> "I get home from school at 1400 but no one around is on then, there must be someone in Michigan with the same problem. *(Get in touch with Roger fellows.)* Also, I'm for anyone between 0600 and 0700 before I go to school. Best DX is W8DX and best heard is VE3DSU. My frequency is 144.12006." *(C'mon gang, give the boy some encouragement before you go to work in the morning.)*

Dover, Pennsylvania: From Pennsylvania we hear from John, (W3SST):

> "The VHF operators in this area have organized a club dedicated to promoting VHF activity. The club has been named the *Keystone* VHF Club. We have twenty-four members and are expecting to have a few more added very soon. Club officers are President, W3SST; 1st Vice-President, U3OWW; 2nd VP, W3HFG, Secretary, W3DEX; Assistant Secretary, W3UQJ; Treasurer, W3EDO; Trustees, W3AXC, W3BSW, W3LHG. The club is open to anyone operating above 50 Mc.

So, see you next month.

73 Sam, W1FZJ

Limitations of Transistors

[*from page 43*]

carrier, when it wasn't *a* carrier but a collection of differently phased and randomly placed carriers.

In extremely low-level audio circuits, the random-walk business will produce a *shshshshsh* noise, too. Yet for moderately low-level work it has advantages over vacuum tubes; a transistor is non-microphonic. If the signal is strong enough to completely swamp the transistor noise, it will do better than a vacuum tube as a first audio stage.

There are transistor 100-kc crystal oscillator circuits available. The 100-kc output is fine . . . but don't look for the higher harmonics. They aren't there. You can, however, run the output into a vacuum tube multivibrator—which is worthwhile in any case—and come out with plenty of 30 Mc. harmonics of the 100-kc note.

Despite the fuzzy oscillator note, transistors work fine as local oscillators in a broadcast band receiver; the pass band of the *i-f* transformers is enormously wider than the fuzzyness of the note, so that the effect is practically undetectable.

Coupling transistors in cascade presents certain problems; there are lovely little transistor coupling transformers on the market—they look like something built by a professional watchmaker after looking at a standard audio transformer. They're expensive, and delicate. Coupling condensers for R-C couplings present problems, too, though they are now available on the market (if you haven't seen 'em, you'll be startled to discover how small a 4 μfd condenser can be!) The difficulty is that the input impedance of a transistor isn't like that of a vacuum tube; instead of running into a grid with a 1-megohm grid resistor, you have an input impedance of about 100 to 600 ohms.

One of the factors overlooked in considering applications for transistors is that frequently a vacuum tube circuit is used for harmonic generating purposes. The 100-kc crystal calibrator is an example. The *operating frequency* is well within the transistor range, but the desired output frequency is actually far outside the range of a transistor. And transistors, because of the drunken-walk effect, simply cannot start and stop operation as quickly as is necessary for the high harmonics needed.

The advantage of transistors is enormous, however, in electronic switching work, such as is involved in computers. They can readily turn on and off at one megacycle repetition rates—which is more than adequate for computer work. And the extremely low power consumption there is a critical factor; a 6SN7 takes approximately 2 watts of heater current. Since a large computer may involve 10,000 6SN7 stages, that's 20 kilowatts for heaters alone.

The plate dissipation will run another 2 watts per tube, making 40 kilowatts. Now electric power is cheap enough that anyone seriously interested in a great computer isn't going to bother himself about paying the power bill—but 40 kilowatts of heat calls for some very fancy air conditioning measures! And accuracy of components is seriously effected when too much temperature rise is permitted, so all that heat has to be carried off immediately.

The computermen look with heartfelt thanks on the little transistor; it works just fine with 100 microwatts; a million of them can be operated on the power to light a single reading lamp! And they last a long, long time.

Transistors are wonderful gadgets. But . . . where do they fit into ham radio?

* * *

You thought maybe this discussion was heading somewhere? Apparently one of John's favorite tricks is to pick up a problem, make a few observations from a strangely different *point of view, and toss it back in your lap looking somehow not quite the same thing you started with. Now, agreed, we haven't built a transistor rig or even decided just where to start. But has anything useful happened to your concept of this strange little semi-conductor device? Sure it has. Incidentally, news reaches us that recent technical advances permit operation of certain transistors as high as 1200 Megacycles!*

Voltage Regulation of Gas Generators

[*from page 40*]

field current when at light load. Under this condition there is the greatest I^2R in the regulator resistive element and this resistor reduces this factor and results in less heating of the regulator. On this generator we had about 10 amps. field current and the regulator did get hot without the resistor but stabilized after about a half hour of operation, but the writer saw no sense in running the unit necessarily hot and incidentally, above ratings. This auxiliary resistor size was determined by disconnecting the regulator resistive element and replacing it with various size resistors until one was found that gave rated voltage at no load. It turned out to be 5 ohms so 7.5 ohms was chosen to give the regulator a little more chance to operate. It turned out perfect.

Figure 5 shows the Leland Altemotor in semi-schematic form. Actually this unit has four brushes located 90° mechanical degrees apart around the commutator. Diametrically opposite brushes are jumped together. When connecting into the field circuit, the two field leads will be found connected to two adjacent brushes. This being a four pole machine, there are 720 electrical degrees in going around the commutator. Brushes mounted 90 mechanical degrees apart are actually 180 electrical degrees apart. If this has served to arouse confusion, any good text on direct current machine fundamentals will clarify these points.

To connect into this field circuit simply lift a field lead where it connects to the brush, leaving the jumper to the other brush connected where it was, and connect the field resistors between this field lead and the point from which it was lifted.

Nothing has been said about stabilizing such a system principally because no instability has been experienced with these small units. Apparently the inherent time constants of the units encountered were such that there was insufficient gain in this closed loop system to cause regeneration or instability. There are standard means of stabilizing this system which the author will be glad to write up should an apparent need for such information arise.

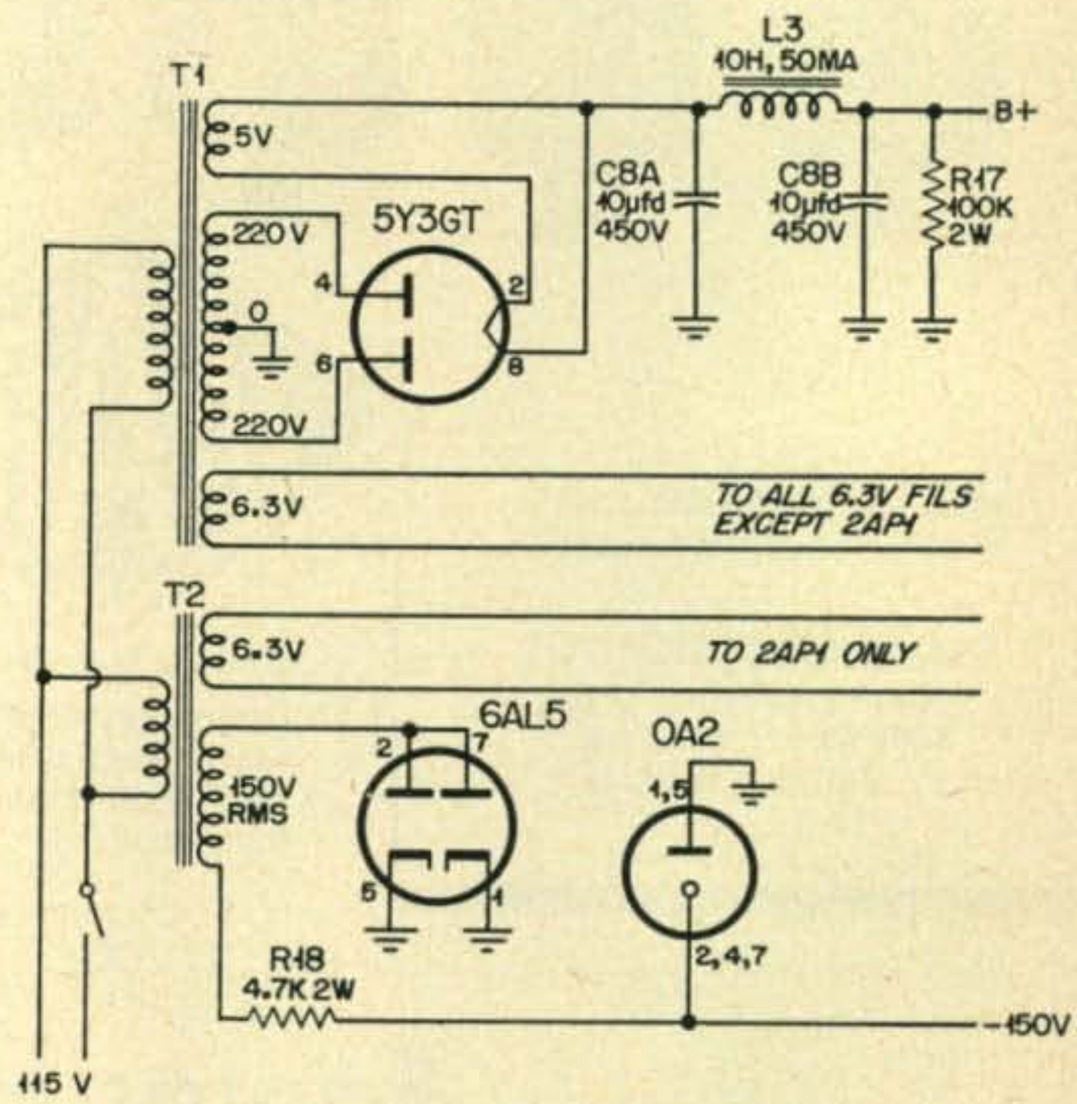
Very little in the way of concrete component sizes have been given. This is because an effort has been made to make the information given herewith general, and it is further the author's intent to impress the reader with the idea that experimental work is necessary to establish exact component sizes and capacities. It is seldom that we encounter two generators exactly alike so with the equipment which amateurs are liable to scrape together most anything can be expected. ■

FSK Tuning Indicator

[*from page 49*]

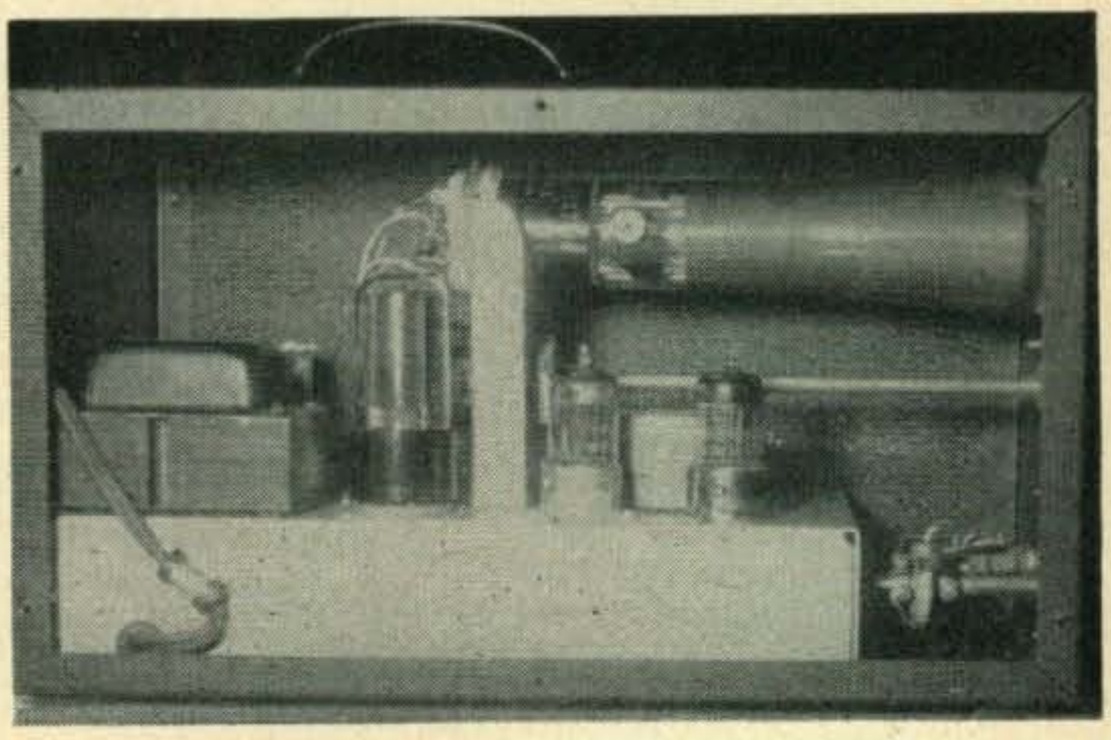
counterclockwise will indicate too low a tone pair.

Selective fading, or incorrect receiver tuning resulting in an unbalanced response characteristic, will be indicated on the monitor 'scope as an X with one leg shorter than the other. (Fine random traces connecting the frequency-display lines result from the transient response of the monitor circuits, and should be ignored.)



Parts List for Power Supply

R17 100K, 2 watts
R18 4700 ohms, 2 watts
C8 10-10 μfd, 450v
L3 10 henry, 50 ma.
T1 **Stancor** PC8404
T2 **Merit** P3046
Notes: The values of 300 volts for B-plus and 150 volts for B-minus are not critical.
A Grayburne V60 adjustable coil L1 is used in the equalizer circuit, (band-pass filter), shown above. The equalizer should series-resonate near 2125 cps.



FSK "Eye" with side-plate removed

An additional feature of this unit is that it may be used to analyze non-amateur telegraph signals using odd or multiple shifts . . . at times more fascinating than printing copy. ■

[from page 109]

28 mc.
G2BVN 4,140 78 9 9 B
(G2BVN–G3EBF)

FINLAND
All Band
OH1AA 111,534 408 49 125 C
(Club Station)

GERMANY
All Band
DL4MW 262,908 530 58 143 C
(DL4IQ–DL4XY)
DL9CI 122,980 323 46 126 C
(DL1CR–DL3AO–DJ2MB–DL9CI)
DL1IL 23,655 165 22 61 C
(DL1IL–DL6KC)

HUNGARY
All Band
HA5KBA 326,899 739 66 167 D
(Club Station)
HA5KBC 75,735 319 49 104 B
(Club Station)

ITALY
All Band
I1SXZ 57,838 263 34 87 –
(I1SXZ–I1CCO–I1-10-001)
I1NT 45,773 264 24 67 –
(I1NT–I1RB)

NETHERLANDS
All Band
PI1RRS 47,619 281 32 85 –
(PI1RRS–PAØINE)

SWEDEN
All Band
SM3AKW 56,100 185 45 105 C
(SM3AKW–SM3AU)
7 mc.
SM3AGD 5,075 138 5 30 B
(SM3AGD–SM3AQD)

SWITZERLAND
All Band
HB9RW 126,768 371 45 107 B
(HB9RW–HB9QU–HB9RZ)

YUGOSLAVIA
7 mc.
YU1AHI 1,820 62 5 21 B
(Club Station)

Altho no category was set up for Novice competition the following sent in logs, and their scores noted.

NOVICE
21 mc.

WN3BWU	782	17	6	11 B
KN6JIV	130	15	5	5 –

Our Thanks to the following stations who sent in logs for checking purposes only:

W1MAN	W3MQY	W3WNP	
W4ZHP	W5DKK	W6DTJ	
W6EJA	W6HPB	W6NAZ	
W8Kyy	W8NND	W8NNH	
W8PQQ	W8TTO	G2DHV	
G3EMM	G3ESP	G3HLY	
G3KAA	G8PW	GM3HXT	
GW2DHM	KA2FC	KA2WV	
LA2B	LA7X	OH2OM	OK1FC
OK1NB	OK1ZW	OQ5FH	
OZ4IM	OZ7KP	OZ6HS	
PAØDOK	SM3BIZ	SM5AQV	
SM6JY	SM7BVO	VK2ZH	
VQ4BY	VS2CB	ZE6JT	ZS6IX.

That is all fellows – see you all next year. FA

Club Scores

Southern California DX Club	**1,592,099**
Ohio Valley Amateur Radio Association.	1,028,379
Potomac Valley Radio Club.	833,713
Northwest Amateur Radio Club.	365,257
Maui Amateur Radio Club.	288,614
Goose Bay Amateur Radio Club. (Canada)	156,695
Japan DX Radio Club. (Japan)	152,591
Lancaster Radio Transmitting Society	145,323
Warsaw Short Wave Club. (Poland)	135,519
Redding Radio Club.	127,038
Navy Mike and Key Club. (Japan)	122,573
Niles Amateur Radio Club.	92,474
Northern California DX Club.	64,870
M. I. T. Radio Society.	64,000
Four Lakes Amateur Radio Club.	59,550
Rochester Amateur Radio DX Association.	29,262
Institute of Technology of Finland. (Finland)	13,838
Milwaukee Radio Amateur Club.	12,803
Loyola University Radio Club.	5,796
Coronodo Radio Club.	3,036
South Shore Amateur Radio Club. (Canada)	1,254
South Hills Brass Pounders. (Novice)	782

LETTERS [from page 18]

step-by-step I mean articles covering the entire mobile installation such as power supply, converter, transmitter and installation in the automobile.

I sincerely think that a series of six-meter mobile articles would create an intense amount of interest in your magazine. I have subscribed to the magazine since June, 1954, and would like to say that I think you should be commended for the terrific change in the last few issues.

William J. Miller, K9BAB

The Ham Shop

RATES: 25c per word per insertion for commercial business organizations.
5c per word per insertion for individuals on a non-commercial basis.
MINIMUM CHARGE $1.00.

CLOSING DATE: 25th of the 2nd month preceding date of issue.

MAIL: Your typewritten copy with full remittance should be sent to CQ Magazine, 67 West 44th St., New York 36, N. Y. Attention: Classified Ad Dept.

NOTE: The products and services advertised in this section are not guaranteed by the publisher of CQ.
Telephone orders not accepted.

FOR SALE

FREE LIST! New and reconditioned receivers, transmitters, etc. One hundred big bargains every month. Highest trade-in allowance. Write today! Dossett, W9BHV, 855 Burlington, Frankfort, Indiana.

CRYSTALS: FT-243's—3500 to 8700 KC ± 2 KC, $1.00 each. .01% setting, $2.00 each. Hundley Crystal Co., 2951 North 36th, Kansas City 4, Kansas.

TWIN-SET precision screwdrivers (9 pieces) underwriters laboratory approved, $1.00 complete, White Company, 1730C Flatbush Avenue, Brooklyn, N.Y.

PERSONAL HAM SUPPLIES! Pocket printer—name, call, address (ink pad included)—$1.00. 500 miniature labels—name, call, address—$1.00. Lucite desk wedge, name or call, gold on black—$2.75. All postpaid. Santer, 544 East 6th St., New York 9, N.Y.

NC-98SW with matching speaker, $120.00. Excellent condition, two months old. 1956 model. Please write: Ronald Boettcher, 209 Kingsbury Avenue, Elmira, N.Y.

GIBSON GIRL, $10; GN37 hand crank generator, $7.50; good surplus 4 wire curl up microphone cables with PL 55 and 68, 75¢ each. WØNIT, 920 West Adams, Pueblo, Colorado.

FOR SALE: Globe Scout 40A transmitter, 50 watts cw-fone, guaranteed excellent condition, $70, f.o.b. Reginald Olson, W9ZQA, Chetek, Wisconsin.

FOR SALE: Eldico TR 75 TV xmtr. and MD 40 P modulator. TVI'd good condition, $60. for both. W1FVC, 27 Fairview Ave., Northampton, Mass.

DXCC DIRECTORY: Complete alphabetical listing. Individual scores. 2900 calls, 125 countries. Beautifully printed. $1.00 postpaid anywhere. W8YHO.

GLOBE KING 400A, HRO-50T, Harvey-Wells Bandmaster deluxe mic., Gonset Tri-Band, converted with 40 mtrs; BC-221-B with mod. All excellent condition. Going for best offers. C. F. Scheid, W3OHV, R.D. #1, Lock Haven, Pa.

FOR SALE: Heath AT-1 transmitter and coupler, $35.00. Also BC457 converted transmitter for 80 cw, up to 75 watts output. Will sell for $40.00. Victor Wanner, W8PWU, Brown City, Michigan.

LEECE-NEVILLE mobile system, 7 volt, 100 amp. alternator, rectifier, 100-0-100 ammeter, mounting bracket, belt and connecting harness, $43.50. Also 500-watt audio amplifier/120 volt 60 cycle single phase power supply, $87., and a 22 tube Navy sweep amplifier, $13.50. William Hudson, 179 Steinmetz, Schenectady, N. Y.

FOR SALE: New and used Gonset communicators, V.F.O.'s, converters, all types mobile gear, and the new G-66 receivers. Also illuminated "S" meters for communicators. Graham Company (W1KTJ), Stoneham, Mass.

FOR SALE: One UHF 20 meter pre-tuned 3 element wide spaced beam excellent condition at $50.00. One 4 element 10 meter wide-spaced beam, $25.00. Ready to install and use, complete with detail instructions. No tuning required. Assemble, mount and you're on the air. Also one kilowatt all-band antenna tuner. Beautiful cabinet and design. Complete $50.00. Write WØIOS, 901 S. 86th Street, Omaha, Nebraska.

"DO IT YOURSELF": Aluminum tubing, castings, stampings, etc. to make your own 2, 6, 10 and 20 meter arrays. Completely assembled 6 meter 5 element Yagi beams, $14.95; 2 meter 6 element, $6.95. Wholesale Supply Co., Lunenburg 1, Mass.

RECEIVER: SCOTT RCH, $87.50; UTC LS-12 low Z to PP grids, $9.75; three 6AQ5's, $2.25; pair 829B's, $14.00; three 5763's, $3.75; four 860's, $19.50; two 809's, $3.50; two 803's, $3.50. Tubes unused. Vibroplex original, $10.95; Four large Selsyns, $29.50. W2BE.

SELL: 10m mobile complete, Gonset tri-band w/noise limiter, Lysco xmitter (B-129), vib. pwr. sup. 300 or 700 v., whip, mount, ant. cable, T-17 mike. First $45.00. Write K2GUV.

MOVING. HAVE bunch of stuff for sale. Tubes, parts, tools, equipment. Write for list, WØDVN, PO Box 5938, Kansas City 11, Mo.

NEW CONDITION: Mallory VP-555H-TR 300 volt 200 mil 6 volt supply. Factory wired 10A sideband exciter, VFO for 20 and 75. Make me an offer. W7PYG, Albert Boaz, 1446 Francis Ave., Walla Walla, Washington.

MATCH-GUIDE STANDING wave indicator, new design using 53 or 75 ohm coax, one kilowatt capability. No resistors used. Twin meter or twin lamp indication. Easy to assemble (about one hour). Specify for 53 or 75 ohm coax feed line. Kit includes material for twin lamp indication. USA only. $14.50. Riddle Engineering, 3106 Sherbrook, Toledo 6, Ohio.

FOR SALE: BC-610E, BC-614 speech amplifier, all tuning units, coils and crystals, $435.00; Four 829-B, $25.00. W8JWD, Harvey J. Miller, 819 Water Street, Tiffin, Ohio.

PERFORATED ALUMINUM sheet, .051, 5/64" OD holes, 1/8" centers, $1.20 sq. ft. cut to size. Send for listing on beams, aluminum tubing, etc. Radcliff's, Fostoria, Ohio.

HAMMARLUND HQ-129X with speaker, very little used. absolutely like new condition, shipped $150.00 F.O.B. New York. Also Pickering Hi-Fi dual cartridge w. 2 diamonds, used 2 months, $35.00. P. Lehr, 15 East Rogues Path, Huntington, N. Y. Hamilton 1-0443.

MARINE CRYSTALS: New, large quartz plates. Best for Marine application. Transmitting $2.95, receiving, $2.50. Specify holder pin diameter and spacing. Airmailed. Crystals since 1933. Amateur, Experimenter. Novice 3500 to 8600 Kilocycles FT-243, $1.00. C-W Crystals, Box 2065, El Monte, Calif.

VIKING KW and desk. Hardly used, $1300. K9CKP, 2607 Main St., Rt. 2, Mt. Vernon, Ill.

TRANSMITTERS, FILTER condensers 6000 working volt 2 mfd., $5.50. For VFO, SSB or conversion ARC-5 transmitters 4.0 to 5.3 Mc. used good, $3.75; 5.3 to 7.0 new $5.75, —10 lbs. All transmitters unmodified, complete with tubes. Racks for three ARC-5 or Command receivers, $1.95; 5 lbs. New 800 and 203-A tubes, $1.75, 2 lbs.; 860 tetrodes, $2.75, 4 lbs.; BC-654-A 80 meter transmitter-receiver, $9.75 less some tubes. R. E. Woods, W6KEG, FOrest 8-3139, 2142 Parkway, El Monte, Calif.

SELL: SUPREME AF 100 factory wired all band xmtr and RME 45 receiver (Calomatic Dial Model) NBFM adapter. $249. H. MacLeod, W2CIT, 3919 William, Seaford, Long Island.

NATIONAL NC 125 with matching speaker for sale. One owner, recently purchased. No trades. First $80.00. C. Friedlander, 810 Northeast Second Street, Delray Beach, Florida.

FOR SALE: Collins KW-1, perfect condition, like new: 110 foot special heavy duty aermotor tower. All offers considered. K2HLB.

FOR SALE: Gonset 6 meter communicator, 6 vdc. Excellent condition, $185. K6ESC, 244 El Monte Ave., Los Altos, Calif.

CENTRAL ELECTRONICS single sideband equipment, National Elmac, RME, Citizen's band transceivers, dynamotors, etc. Bob Wolfe, W3HDT, Bob Wolfe Electronics, 2506 Hoffman Street, Baltimore 13, Maryland.

200 WATT 813 xmtr, power supply, 80 and 40 coils. Built-in pi-network and VFO. Includes also external antenna tuner. 1 Kw. low pass filter and coaxial cables. All for $85. or best offer. Free delivery within 35 miles. No C.O.D.'s. Send for details and pictures. Will ship. W7YOQ, 4521-46 N.E., Seattle, Washington.

COLLINS 310C-2 exciter. Uses 70E-8 PTO output on 80 meters, with power supply, in excellent condition. Don McNamara, Anamose, Iowa.

FOR SALE: Johnson Viking I, BC-221 converted to VFO, drives Viking on all bands. Turner xtal mike, complete with all tubes. $150.00. National NC-183 receiver excellent condition. Factory overhauled, matching speaker, $175.00. R. E. Blad, 576 I Avenue, Coronado, Calif.

SELL: CQ. May 1946 through August 1954, missing July 1947; QST. January 1924 through January 1939; IRE bound in buckram. 1940 through 1954, plus January, February, March 1939; RCA Review, Volumes 2, 3, 4; Radio Stations of the United States, July 1, 1916; Amateur Radio Stations of the United States, June 30, 1931. Both issued, United States Department of Commerce. Any reasonable offer accepted. I. H. Anderson, WØHY, 1709 3rd Ave., So. Anoka, Minn.

SELL: Hq-129X, $140.; Viking Ranger, $190.; Signal Sentry, $17.50; Baluns, $6.; 150 watt antenna tuner, $15.; Heath VTVM, $20.; Heath GDO, $15.; BC-454B, $10.; JT-30 mike, $6.; misc. parts and tubes. List. WØEBA, Byron Engen, 1813 University Ave. SE, Minneapolis, Minn.

JAPANESE CRYSTAL mikes—brand new. Famous Rion M-220, $500.; SCR-522 like new unmodified, $40.; Original boxed new 813's, $6.00; BC-221AH excellent condition freq. meter, $65.; all items shipped prepaid. Bill Slep, W4FHY, Ellenton, Florida.

BARGAINS: WITH new guarantee: S-38D, $37.50; S-40A or S-77, $69.00; S-47C, $49.00; Lysco 600, $69.00; S-27, $79.00; SX-28A, $149.00; S-76, $119.00; SX-71, $139.00; SX-96, $189.00; SX-88, $375.00; HQ-140X, $189.00; SX-42, $139.00; HRO-50T1, $279.00; SOJ, $9.95; Collins 75A3, $349.00; Collins 75A2, $299.00; Sonar VFX 680, $14.95; Eldico TR75TV, $35.00; Meck T-60, $39.50; HT-17, $29.95; EX Shifter, $35.00; Globe Scout 40A, $69.50; Globe Trotter, $49.50; HT-18, $49.00; Harvey Wells Sr., $69.00 Harvey Wells VFO, $25.00; Elmac PMR recr., $89.00; PSA-500, $24.95; Viking I, $129.00; Viking VFO, $32.50; Viking II, $229.00; Globe King 275, $249.00; Globe King 400A, $299.00; 32VI, $275.00; 32V2, $349.00; 32V3, $475.00; and many others. Free trial. Terms financed by Leo, WØGFQ. Write for catalog and best deals to World Radio Laboratories, 3415 West Broadway, Council Bluffs, Iowa.

FOR SALE: Transmitter, Johnson Viking II, Viking VFO, matchbox, low pass filter, AC line filter. In good condition. W8HPB, Box 205, Canal Winchester, Ohio.

NEW BC-348 less case, $65.00; Hewlett Packard Audio Generator, model 208 output 50, 200, 500, 5000 ohms antennuator metered output —O-10, 0-100 DB antennuator for 500 ohm input including metered input, $150.00; New BC-221 frequency meter original book and crystal including spare tubes, $115. Syd Gellman, K21MW, 1268 E. 12th St., Brooklyn 30, N.Y.

HALLICRAFTERS S40A receiver, Globe Scout transmitter. Both in very good condition. Send to: Douglas Rich, 208 Strkyer Street, Archbold, Ohio.

NATIONAL SW3 receiver with 4 sets coils and power supply, $25.00; Gonset 2 meter converter, new, $45.00; Hammarlund 420 transmitter, $75.00; 2" scope, $20.00; PE 103 with cables, $25.00; SRC 522-2 meter transmitter and receiver, $25.00; L M freq. meter same as BC 221 only with factory power supply, $115.00; 75 meter mobile transmitter and modulator, $25.00; 1 KW 60 cycle generator, $85.00. M. D. Welch, 2749 49th S.W., Seattle 16, Washington.

HQ129X, $159; HQ120X, $115; NC183D, $269; SX16, $89; RME69, $89; WRL65A, $79.50; SX28A, $149. Electronic Labs, Station A-21, Lincoln, Nebr.

EXCELLENT LOW power phone-CW buy: Viking adventurer with PP 6BQ6's 25 watt modulator including all circuit diagrams and instruction book, $75.00; VF-1 wired and operating with above rig, $20.00. K2OPF, 5823 218th Street, Bayside, L. I., N.Y. BAyside 9-3249.

FOR SALE: HQ-140-X, $175; Slicer model "B," $60; Ranger, $150; Communicator II, $160; Panadaptor, $28; 4-250-A new, $27; Matchbox, $32. Getting married—need cash. W2YGA, Clinton Corners, N.Y.

MOBILE RIG, complete with PE103 dynamotor, 6V coax relay, all band 6146 final xmitter built exactly as per article in October 1955 QST or page 436, 1955 Handbook, including 5BR2 Morrow converter with Motorola BC receiver. Complete $100. F.O.B. Fred R. Stover, WØIQW, 700 13th Avenue, S.E., Rochester, Minn.

Hopped NC-101X amateur bands only 5½ ft. band spread, $100.00; New 115 volt AC 50/60 cycle variac 0-135 AC output 2.8 KVA, $35.00; New 110 volt AC 2 KW antenna relay including new Simpson 0-5 RF amp meter 3 coax fittings mounted in utility box, $20.00; New pair of 4-125A, $35.00; Original PE-103, $25.00; New CG-306 UTC plate transformer 2-KV at ½ amp, $55.00; Gonset signal slicer 455 KC-IF, $20.00. Syd Gellman, K2IMW, 1268 E. 12th Street, Brooklyn 30, N.Y.

TREMENDOUS BARGAINS: New and reconditioned Collins, Hallicrafter, National, Johnson, Elmac, all others. Completely reconditioned with new guarantee. Hallicrafters S-38, $29.00; S40B, $79.00; SX71, $149.00; SX96, $199.00; HQ129X, $159.00; HQ140X, $199.00; National NC125, $129.00; NC173, $139.00; NC183, $189.00; HRO5OT, $199.00; NC183D; HRO5OT1; HRO60; Collins 75A1, $239.00; 75A2, $289.00; 75A3; 75A4; 32V1, 32V2; 32V3; Viking Ranger; Viking II; large stock of mobile receivers, transmitters, converters, hundreds of other items. Easy terms. Shipped on trial. Write for free list. Henry Radio, Butler, Missourit.

RUBBER STAMP: Top quality, with your call letters, name and address, $1.50. Pad, 35¢. El Kay Stamps, Box 5, Toledo 12, Ohio.

TELEPHONE TRANSMITTER: Hand set type. Suitable for inter-house phones, speakers or any communication purpose. Delivered two for $1.00. No C.O.D.'s. Telephones, Dept. C-131, 1760 Lunt, Chicago 26.

SAVE! BUY surplus direct from Government at tremendous savings, radio, electronic equipment, parts, power tools, machinery, hundreds others. List, $1.00. Box 169CAF, East Hartford 8, Conn.

RUBBER STAMP: Call, name and address, with inking pad and plastic case, $1.00. Richard's, 2029c Bradley, Chicago 18, Illinois.

SWEEPING HAMDOM: Beautiful, rugged rubber door mat with your call, handle (hams, SWL's) 18" by 28". Red, green, blue, black. Thirteen 2⅝" characters maximum. Sorry, no Ø's. $6.50 postpaid. Brownie, Box 126B, Marblehead, Mass.

ATTENTION MOBILEERS: Leece-Neville 6-volt 100 amp system. Alternator Rectifier and Regulator, $60.00. Also Leece-Neville 12-volt 100 amp system. Alternator, Rectifier and Regulator, $85.00. Good condition. H. A. Zimmermann, Jr., K2PAT, 570 Jamaica Avenue, Brooklyn 8, N. Y. UL 2-3472.

MULTI BAND-ANTENNA, 80-40-20-10, horizontal centerfed, low SWR line. Patented. Write Lattin Radio Laboratories, Owensboro, Kentucky.

FOR SALE: Leece-Neville 6 volt system 100 amp. alternator, rectifier, voltage regulator with mounting brackets, schematic. Excellent condition, $49.50. Samuel Lieberman, K2IFL, 130-29 228th Street, Laurelton, Queens 13, N. Y. LA 7-1642.

SELL: 1954 Ford car radio, Gonset super six, in excellent condition. Also master all-bander antenna with fiberglass whip. Will sell together or separately. Phil Clements, P. O. Box 59, Belton, Texas

HRO-60. Like new. With speaker, all coils including 15 meters, crystal calibrator, $400. Primrose 5-7263. W2ODI, Floral Park, Long Island.

HEATHKIT DX-100 completely built and factory tested. $185, plus freight and $5, crating charge. Alvin Peterson, 631 N. Cuyler, Oak Park, Illinois.

FOR SALE: Six new JAN 832A tubes, $6.00 each, F.O.B. Refund if not okay. WØAJU, 7475 Rupert, Richmond Heights 17, Mo.

FOR SALE: Knight 50 watt transmitter wired. Brand new. Must sell. Best offer. Robert G. Green, W9WTH, 329 South Scoville Ave., Oak Park, Illinois.

NATIONAL NC-300 brand new in original factory sealed carton. Best offer over $330. takes it. Wells E. Burton, W2UJS, 1038 Front Street, Binghamton 96, N. Y.

MISCELLANEOUS

RECEIVERS REPAIRED and aligned by competent engineers, using factory standard instrument. Hallicrafters, Hammarlund, National, Collins-authorized service station. Our twentieth year. Douglas Instrument Laboratory, 176 Norfolk Avenue, Boston 19, Mass.

YOUR CQ's, QST's permanently bound, $6. per volume. Books repaired, fine work, reasonable. W3UCT.

LOG SHEETS: Scientifically designed for your satisfaction: 75 sheets, $2.00; 200 sheets, $4.00; 500 sheets, $9.00. Jara Sales Co., P.O. Box 404, Times Square Station, New York 36, N. Y.

QSL's

QSL's—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QSL-SWL, Bartinoski, Williamstown, N. J.

QSL SAMPLES. Dime, refundable. Gale, W1BD, Waterford, Conn.

QSL-SWL's! Quality cards. Samples 10¢. Malgo Press, Toledo 14, Ohio.

QSL-SWL's high quality. Reasonable prices. Samples. Write, Bob Teachout, W1FSV, 204 Adams Street, Rutland, Vermont.

QSL's: SAMPLES, dime. Print Shop, Corwith Iowa.

QSL's LARGEST variety samples 25¢ (refunded). CALLBOOKS (latest) $4.00. Sackers, W8DED, Holland, Mich.

QUALITY QSL's, Samples, 10¢. Lee, W5CZA, Box 7171, Oklahoma City, Oklahoma.

VACATION RESORTS

VACATIONS: HAM with my equipment, American plan. Modern cabins. Nice for children. Lighthouse Lodge, Big McKenzie Lake, Spooner, Wisc. W9HZC.

INSTRUCTION

PORT ARTHUR COLLEGE, Port Arthur, Texas, provides training in Radio, Radar, Television necessary to pass FCC examination for Phone and Tel licenses, 12 to 14 months. Advanced TV 6 months. Start at any level. Progress at own rate. Work toward standard. Low tuition, Board & Room at cost in dormitory. Advanced students receive on-the-job training at KPAC, 5000 watt radio station, owned & operated by the college. New courses start every 5 weeks. Approved for Veterans. Write Registrar for catalog & information.

TAPE RECORDED code courses. None other comparable. Full course $20, tapes alone worth $9. Send stamp for particulars. Tapedcode, Box 31, Langhorne, Pa.

INCREASE CODE SPEED. New method. Free particulars. D. H. Rogers, Gough Ave., Ivyland, Pa.

SWAP OR SELL

SELL OR TRADE: Excellent Eldico TR-75TV4 complete with 80, 40 meter coils and new Eldico model VFO-2. Best deal or $50 cash. No TVI if used with ground plane. Will ship f.o.b. W4BXV, Box 123, Quitman, Ga.

SELL-TRADE: Radio Magazines—QST solid 1935 through 1946. Bob Farmer, Plainview, Texas.

SWAP: ARGUS A-2 with case; Admiral 10 T.V. chassis; both A-1 condition. Want 6-meter equip. Kenneth Nicks, 2395 Coates, Dubuque, Iowa.

SELL: NEW 4D32 tube, $14.00 postpaid. Wanted, 6 MC. filter for Collins 75A-3; also Tecraft 1¼m. converter, (26-30 Mc. I. F.) Roy Sawdey, 5255 Harper, Solon, Ohio.

SELL OR SWAP: Latest model Morrow 5BR-2 all band converter for 6 or 12 volts; Subraco 10 meter mobile transmitter with matching dynamotor for an HQ129X or similar receiver. W8CWV, 1987 Rookwood, Cleveland 12, Ohio.

FOR SALE OR TRADE: BC348R receiver in working condition with power supply. Best offer over $35.00. Also power transformer 105/110 volt AC input, 3000 volt 500 Mil DC output, and one 500 Mil swinging choke and one 300 Mil smoothing choke. No reasonable offer turned down. J. B. Isenagle, K5CJU, 2117 Calle de Suenos, Las Cruces, N. Mexico.

SELL OR trade for testers or camera, etc. N.R.I. communications course, lessons, xmtr parts complete. Value $325, sell for $175. P. Fenrich, Choiceland, Sask.

MEDICAL HAMS: Swap Burdick EK-11 (2) for Globe 500-A. C. R. Faulkner, M.D. (K4AXE).

MEISSNER 150B, companion VFO, 10 through 160, $200. Trade for new TV, DX100. Deliver 200 miles WØCKX. Dolton, S. D.

HAMFEST

GALVESTON ISLAND, off the coast of the Republic of Texas, is where 1000 hams will be meeting at the 26th Annual West Gulf Division Convention next June 15, 16 and 17. This convention will have everything; prizes, displays, contests, transmitter hunts, beach party, dance, technical meetings, banquet and even deep-sea fishing. After the pirate Jean Lafitte buried his treasure in Galveston it has been known as Treasure Isle—The Playground of the South. So, y'all come to Treasure Isle and have fun at the Convention. For additional information or registration blanks write to Hank. W5ULN or to his XYL Betty, W5VNI, P.O. Box 956, Galveston, Texas.

SECOND ANNUAL Hamfest—The Breezeshooters' Net—The Lodge, North Park, Pittsburgh, Pa., Sunday, May 13, 1956. Registration free—donations accepted—many FB door prizes. 1) NC 300 receiver; 2) Tripplett multitester; 3) Blue racer key; 4) Grid dipper; 5) Q multiplier. Harold Link, W3SIR.

WANTED

WANTED: TUBES—Boxed and unboxed transmitting, receiving, and special-purpose industrial types such as Klystrons, etc. Also will buy excess test gear, Hickok tube checkers, Variacs, etc. Will pay cash or swap you for choice equipment and tubes. B. N. Gensler, W2LNI, 330 West 11th Street, New York 14, N. Y.

SELL YOUR back issues of CQ. We will pay 10¢ each for all issues before March 1954, in good condition. Send them to Circulation Dept., CQ Magazine, 67 West 44th St., New York 36, N. Y.

$200.00 OR MORE for Tuning Units TN-54/APR-4 (2,000-4,000 Mc.). Also need parts, etc. Engineering Associates, 434 Patterson Road, Dayton 9, Ohio.

AN/APR-4 tuning units, ARC-3, ARC-1, good surplus and commercial laboratory items wanted. W8KTL, Far Hills Branch, Box 26, Dayton 9, Ohio.

MOBILE TRANSMITTER and equipment, Viking or other commercial built unit. Describe. John Olson, W7TYW, Box 475, Philipsburg, Mont.

WANTED: RCA DW modulation transformer; Amertran special transformer 6200 V CT @ 750 Ma; Jap mike AIWA-M18. Box 62, Brooklyn 12, N.Y.

WANTED: ALL types of electronic tubes: broadcast, transmitting, receiving, Magnetrons, Klystrons, also all varieties airborne equipment: ADF-70; ARC-1, -3, -4, -12, -15, -27, -33; ARN-6, -7, -12, -14, -18; -342, -610E, -788C, -2121; I-152, ID-48; MN-24C, -31C, -36, -42, -53, -58, -61, -85, -97F, -100A; RA-18, TA-18; 17-L3; 51-R, -R3; 51-V1, etc. Top dollar paid. Write to Robert Sannet, W6REX, 1524 S. Edris Dr., Los Angeles 35, Calif.

WANTED: NATIONAL NC-101XA receiver. Please state price and condition. Donald F. Cameron, 1616 Milburn Avenue, Toledo, Ohio.

WANT: LAMPKIN test gear. K9CKP, 2607 Main, Rt. 2, Mt. Vernon, Illinois.

WANTED: MOBILE xmitter and power supply. W5AVH, Atlanta, Texas.

WANTED: NO. AC, 15 meter coil set for HRO-50-T1. Charles B. Price, W4ZQA, 401 W. Boulevard, Charlotte 3, N.C.

ARE YOU cleaning shack? Church radio club needs any ham equipment for club use and for forwarding to missionary hams. We pay shipping charges for usable equipment, and send receipts which are valid for income tax deductions, for the value of the equipment. Pleasant Grove Friends Church, RR #1, Hutsonville, Ill., KN9BEM, pastor.

WANT: USED amateur receivers, transmitters, and ARC-1, ART-13, ARN-7, DY-17, CU-25, APR-4, BC-610-E, BC-614-E, BC-939A, BC-342, BC-348, BC-312, BC-221, 32V, 75A, Teletype, Technical Manuals, Test Equipment, etc. Cash or trade for New Johnson Viking, Ranger, National NC-300, Hammarlund Pro-310, HQ-140, Hallicrafters SX-100, Barker Williamson #5100B, Gonset, Elmac, Harvey Wells, Morrow, Central Electronics, Telrex, Fisher, Hi-Fi, Kuehne Towers, etc. Write or phone: Tom, W-1-AFN, Alltronics, Box 19, Boston 1, Mass. Richmond 2-0048. (stores: 44 Canal, Boston; 60 Spring, Newport, R. I.)

#UL-1008 oscillation transformer, #UR-542 sockets, #PR-535 rheostats, all made during 1921 by the General Electric Company for RCA. Also a ¼ or ½ K.W. spark transformer, manufacturer does not matter. Also old battery operated radio sets and speakers. George N. DeLaplaine, Post Office Box 861, New Brunswick, N. J.

CQ Ad Index

. . . look how National is celebrating its 42nd ANNIVERSARY!

NEW LOW PRICE on the popular NC-88

. . . now only $99.95

(FORMERLY $119.95)

Now . . . National Company has reduced the price on the fast-selling, popular-priced NC-88 receiver. You can own a NATIONAL NC-88 for only $99.95 . . . $20 less than the original price on this outstanding equipment!

How come?

Because NATIONAL is celebrating its 42nd Anniversary, you can share in the festivities by taking advantage of this opportunity to own a top-quality receiver for less than $100.

This fine instrument — ideal for experienced amateurs, novices and short wave listeners alike — offers you the extra-value features you've come to expect from NATIONAL at an unheard-of price. For example, the NC-88's main tuning and bandspread capacitors are connected in parallel on all bands to permit bandspread tuning at any frequency within the range of the receiver. A logging scale is provided for extra convenience.

One RF and two IF stages in an up-to-date superhet circuit insure excellent sensitivity and image rejection.

The NC-88's audio system feeds 1.5 watts at less than 10% distortion to its built-in speaker, and you can plug an external 3.2 ohm PM speaker into the phone jack, if desired.

CASH IN NOW on NATIONAL's 42nd Anniversary Celebration. Drop in at your local distributor's showroom . . . see and buy this fine receiver at the exceptional price of $99.95!

Look at these features in a receiver for under $100!

- Antenna trimmer
- Calibrated bandspread for 80, 40, 20, 15, 11 and 10 meter bands (large, indirectly-lighted lucite scales)
- Advanced AC superhet circuit uses 8 high gain miniature tubes plus rectifier
- 2 audio stages with phono input and 2-position tone control
- Separate high frequency oscillator
- Built-in speaker and headphone jack (may be used for 3.2 ohm external PM speaker)

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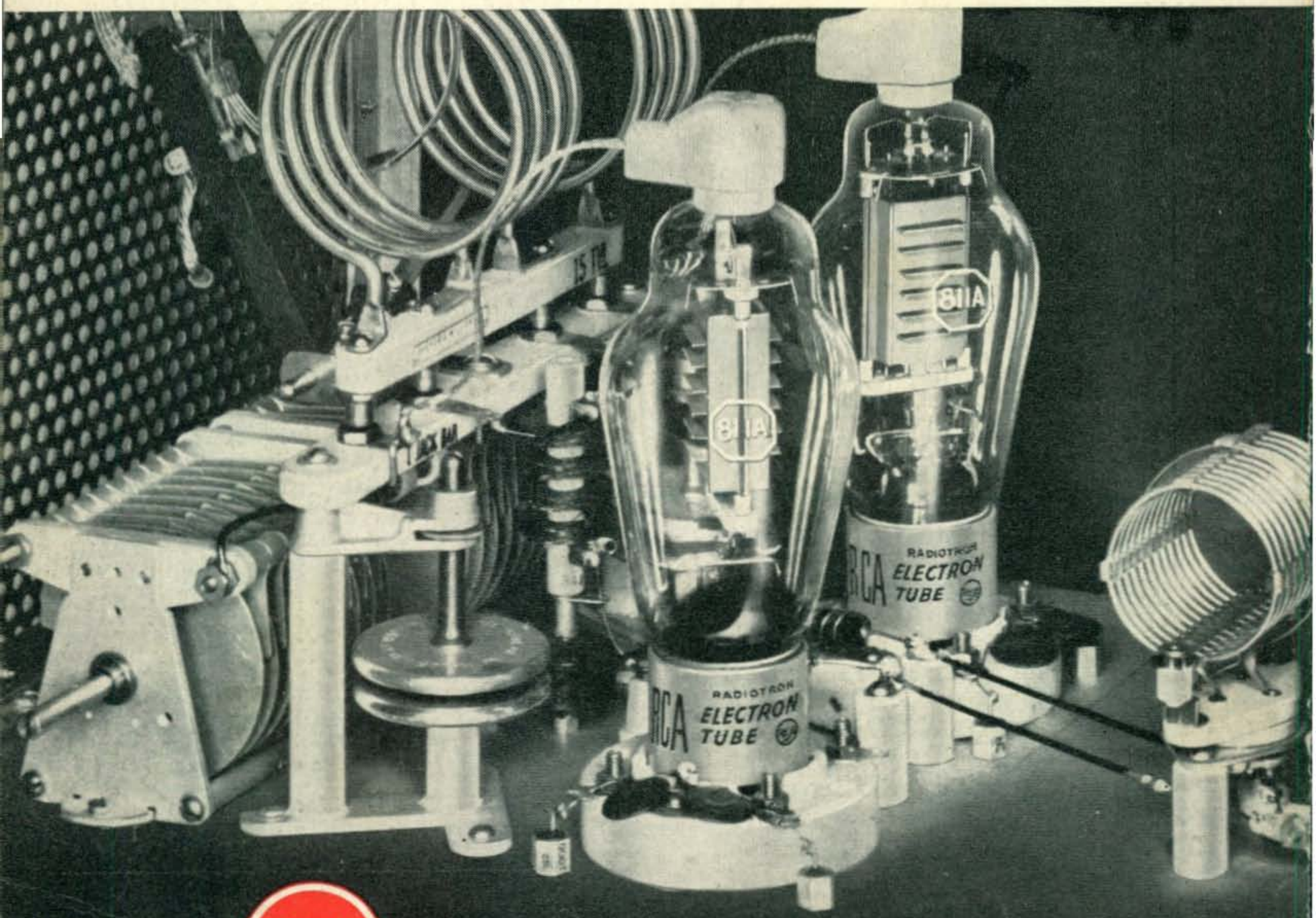
Home-constructed—and described in detail in the 14th edition of the Radio Handbook, the businesslike power amplifier you see below takes 350 watts input on all bands from "ten to eighty." Two RCA-811-A triodes, in push-pull, deliver the signal wallop.

Here's why RCA-811-A's are a favorite among amateurs who build their own. Under ICAS conditions, a single 811-A can take 260 watts input on CW, 175 watts on phone—up to 30 Mc. Two 811-A's in push-pull deliver up to 340 watts of audio as class B modulators.

When you QRO, do it economically—with RCA-811-A's. Your RCA Tube Distributor has them. For tube technical data on the 811-A, write RCA, Commercial Engineering, Section E15M, Harrison, New Jersey.

NEW—14th Edition of "RADIO" Handbook, William I. Orr, W6SAI editor—describes the 350-watt "final" that uses 2 RCA-811-A's in push-pull.



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