

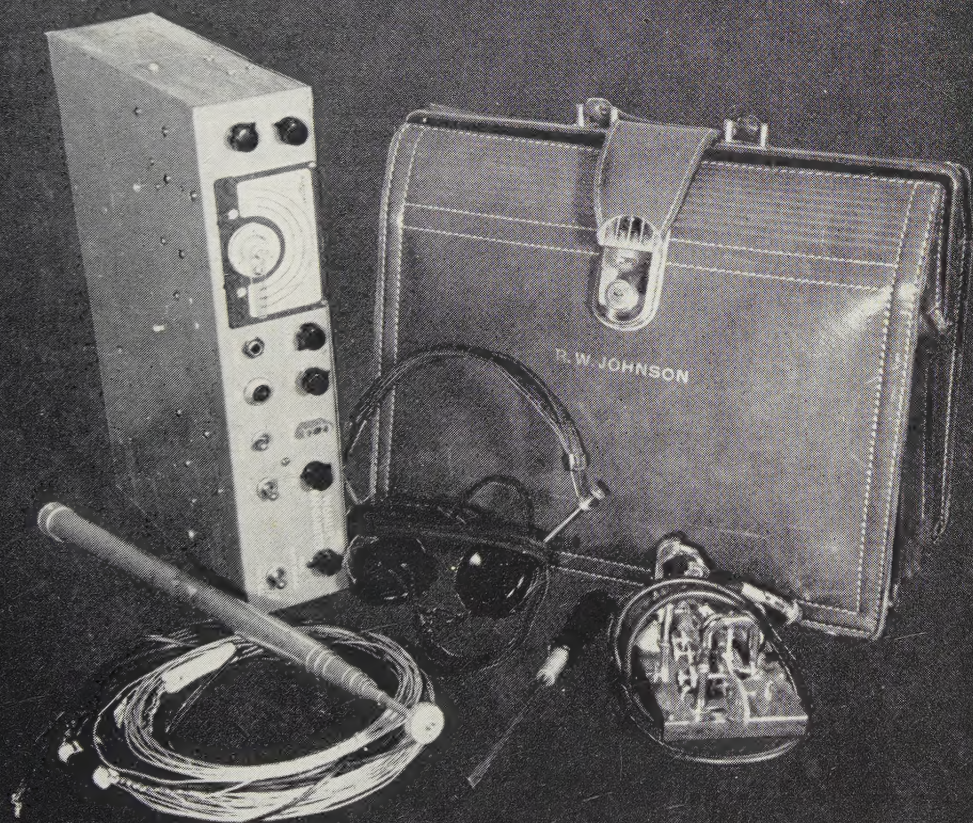
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JOURNAL



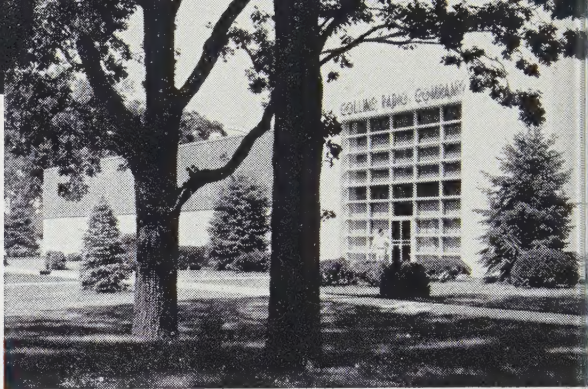
In This Issue =

Table Top Transmitter for Two... Complete
"Brief Case" Station... "Junkeyboard"...
Telescoping Towers for Working DX...

SSB—

TRANSMITTER

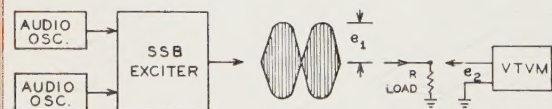
POWER and DISTORTION



While single sideband transmitter power output and distortion have both been discussed previously, the importance of the relationship between the two has not in general been recognized. The reduced bandwidth required by SSB is one of its chief advantages. But distortion in SSB like overmodulation in AM destroys this advantage. The problems involved in SSB distortion should be recognized so that this important advantage is realized in practice.

First, a definition of the transmitter power we are talking about: We have "peak power", "average power", "peak envelope power" and "talk power"—all useable terms if properly defined. The power that an amateur is interested in is the power input to his final amplifier, commonly measured (acceptable to the FCC) by multiplying the plate voltage by the maximum plate current observed on voice peaks, with a plate current meter having a maximum time constant of 0.25 seconds. This power would be called the "peak power input." This method does not give the absolute peak power input since the plate-current meter will not respond fast enough to indicate the current on modulation peaks.

The amateur may also be interested in the power output of the exciter driving his power amplifier. SSB power output is generally referred to as "peak envelope power (P. E. P.)." "Peak envelope power"



has been defined as the RMS power during the maximum RF cycle which occurs in the transmitter. When making the two tone tests, this occurs during the coincidence of the peaks of the two test tones. The diagram shows the transmitter output waveform when making a two-tone test. An oscilloscope will show the peak voltage (e_1) across the transmitter load. A VTVM will read the output voltage. However, most VTVM's are calibrated in RMS volts so that the value (e_2) is 0.707 of the amplitude shown on the scope. Then $P.E.P. = (0.707e_1)^2/R$ if the voltage is

measured on a scope, or $P.E.P. = (e_2)^2/R$ if the age is measured with a VTVM calibrated in RMS

All amplifier stages have some non-linearity. degree depends upon such things as DC operating voltages, RF grid-input voltage and plate-voltage swing. With non-linearity, intermodulation distortion is produced. The distortion of an SSB transmitter considered to be the difference in db between level of the desired modulating tones and their third order products. For instance, if we were to modulate with two tones of 2000 and 3000 cps respectively, two third order products would be at 1000 and 4000 cps (obtained from $2f_1-f_2$ and $2f_2-f_1$). A selective receiver such as the 75A-3, with an 800 cps mechanical filter, can be tuned across the spectrum and the peaks of each of the above signals can be read on the meter. If assuming a transmitted bandwidth of 1000 cps we can see that the 3rd order product of 4000 cps in the above example could interfere with a nearby signal. The difference between the measured level of the two desired tones, 2000 and 3000 cps, and undesired 3rd order modulation products, 1000 and 4000 cps, should be at least 25 db in order to minimize the interference. The distortion products can fall on either side of the desired channel and within it. Distortion products such as the 5th, 7th, etc., will also be present but are generally lower than the 3rd order products. If the 3rd order products are high, the 5th, 7th, etc., will also be high and the interference created will cover much more of the band.

From the above examples, it can be seen that a linear amplifier can be given considerably different ratings. For instance, an amplifier may be capable of producing 3 watts P.E.P. output with the 3rd order distortion down 30 db. By changing the bias and operating it harder, it may be possible to produce 10 watts output but the 3rd order distortion may be down only a little as 6 to 10 db. Obviously, with the second method the amplifier is producing considerably more distortion and interference.

It is essential then that linear amplifiers be operated conservatively if we are to obtain the maximum improvement possible from an SSB communication circuit.

COLLINS RADIO COMPANY • Cedar Rapids, Iowa

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1930 Hi-Line Drive
DALLAS 2

2700 W. Olive Ave.
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COLLINS RADIO CO. OF CANADA, LTD., 74 Sparks St., OTTAWA, ONTARIO

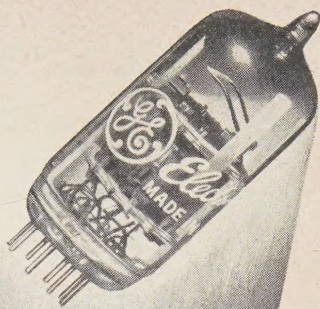


G-E TUBE QUALITY SHOWS IN SUPERIOR DESIGN DETAILS

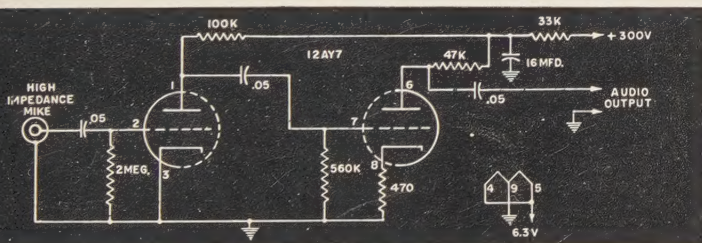
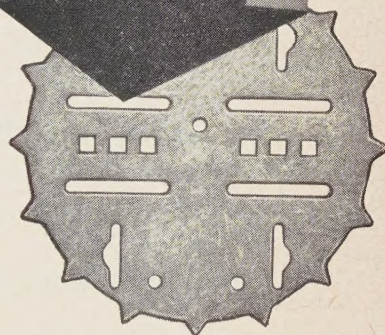
THEY'RE special, the 4 slots that G.E. puts in the mica spacers of 12AY7 twin triodes. The slots act as barriers to plate-to-grid leakage, which can cause that baneful "egg-frying" noise in audio amplification.

You get a quiet tube in the 12AY7 because G-E designers made sure that every part is engineered for low microphonics. As with all General Electric tubes, 12AY7 high quality isn't merely determined by tests—instead, it starts at the drawing-board, is a product of many G-E design features that join to assure optimum performance.

See the 12AY7 at your G-E tube distributor's! Buy G-E tubes for every ham requirement! You can be sure your needs will be met by efficient types *designed-in-detail* for their jobs! Tube Department, General Electric Company, Schenectady 5, New York.



EXAMPLE:
12AY7 mica
spacers are slotted
against plate-to-
grid leakage.



● Low noise level of G.E.'s 12AY7 enables this 2-stage amplifier to boost speech input with a minimum of hum and hiss. Build the device on a turret-type socket . . . it will take up only 1 square inch chassis space!

CQ . . . CQ . . . Have you nominated your Edison Award candidate?

Letters must be postmarked not later than January 3, 1955. If you haven't selected your candidate, please do so soon—then prepare and mail in your nominating letter.

Instructions were given on this page in September. Trophy, gift, and national acclaim will go to the amateur who has rendered outstanding public service in 1954!

GENERAL  ELECTRIC

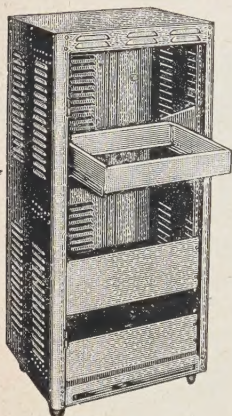
16G-1B6

November, 1954 • CQ • 1

Now add extra
convenience to
your rig with

BUD
Golden Glow

**SLIDING
DRAWER
ASSEMBLY**



The new BUD S.D. 1717 Sliding Drawer Assembly is easily and quickly assembled and installed in any standard rack. Can't fall out, can't tilt . . . perfectly safe mounting for any object placed on it. Slides easily in and out on ball bearing suspension in the same manner as the drawers in the most expensive steel filing cabinets.

Here Are Some of the Many Uses of the BUD Sliding Drawer Assembly

1. Mounting for record player
2. Base for portable typewriter
3. Mounting for apparatus or instruments
4. Base for writing table
5. Handy drawer space

In addition, there are many other handy uses for this practical drawer.

LOOK AT THESE CONSTRUCTION FEATURES

Chassis formed from one piece 14 gauge aluminum.

Electrowelded. Chassis size $16\frac{3}{4}$ " x 14" x 3" with $\frac{1}{2}$ " flange top and bottom.

Support brackets formed from one piece $\frac{1}{8}$ " aluminum.

Brackets accurately punched to conform with standard panel mounting holes.

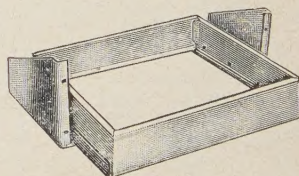
Slide rail fastens securely to chassis, slides easily in and out on ball bearings in channel.

Stop screw on slide rail prevents drawer from falling out of channel.

Support brackets and channel finished in etched aluminum.

Chassis and slide rail finished in gold-tone will support up to 50 pounds.

Also available, aluminum plate which may be fastened to top of chassis as shelf, desk top or support; or attached to bottom of chassis to form drawer. Size $16\frac{3}{4}$ " x 14". Made of 14 gauge aluminum. Gold finish. Punched with four mounting holes. Catalog No. T.P.—1718.



Catalog No. S.D.—1717

Sliding Drawer Assembly

Amateur Net.....

\$10.65

Catalog No. T.P.—1718

Drawer Plate

Amateur Net.....

\$2.19

See these products at your nearest Bud distributor



BUD RADIO, INC.

2113 East 55th St.

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Cleveland 3, Oh

Managing Editor

Oliver P. Ferrell

E. Miles Brown, W2PAU

Technical Consultant

Herbert S. Brier, W9EGQ*

William I. Orr, W6SAI**

Assistant Editors

November, 1954

Vol. 10, No. 11

Our Cover Photo

The "Brief Case" station used by W6MUR. See page 34.

CQ

Editorial Staff

Jack N. Brown, W3SHY

George Jacobs, W2PAJ

G. Franklin Montgomery, W3FQB

Louisa B. Sando, W0SCF

Wilfred M. Scherer, W2AEF

R. C. Spenceley, KV4AA

Contributing Editors

Thomas Smith, W2MCJ

Draftsman

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Editorial Assistants

Business Staff

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S. L. Cahn, Advertising Director

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Branch Advertising Offices

ed E. Schell, 2700 West 3rd Street,
Los Angeles 5, Calif.,
DUmkirk 2-4889.

Richard E. Cleary, Commercial Bank
Bldg., Berea, Ohio, BErea 4-7719.

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Swanston St., Melbourne C1, Victoria,
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385 Johnson St., Gary 3, Indiana
555 Crestline Drive, Los Angeles 49, Cal

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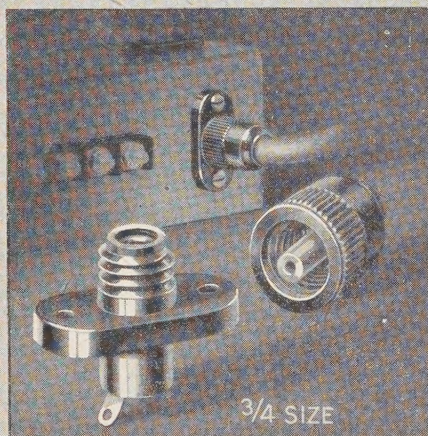
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Designed for



Application



THE NO. 37001 SAFETY TERMINAL

An old favorite in the line of exclusive Millen "Designed for Application" products. Combination high voltage terminal and thru-bushing. Tapered contact pin fits firmly into conical socket providing large area, low resistance connection. Pin is swivel mounted in cap to prevent twisting of lead wire. Easy to use. $\frac{3}{4}$ " o.d. insulation high voltage cable fits into opening in cap. Bared conductor passes thru pin for easy soldering to pre-tinned tip of contact plug.

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MAIN OFFICE AND FACTORY
**MALDEN
MASSACHUSETTS**



Feenix, Ari

Deer Hon. Ed:

If you are by chancey peeking out Hon. Window from high up in your skyscraper office, and seeing sumbuddies floating by on nice soft cloud, that will be me. Yes indeedy, boy oh boys, are things hunky-dunky lately. Wowie!! Normally old Scratchi am not easily affected, but the dream of every amchoc just coming trew to me. It are all coming abouts in most unyoushewall way.

Hon. Brother Itchi are having good friend from way backs who inheriting local amchoor radio supply house cupple years ago. Now this selfsame feller are talking to Itchi resently, and saying how he wishing he could taking off and getting month vaycayshun. Running radio store by himself he not having anybuddies to take over. Also, can't afford ing to paying much even for vaycayshun time. Anyhows, cutting long story down to cupple chit-chat Brother Itchi saying I'd be happy to helping, and saying shure thing, so last month, there I are, in charge of local radio store.

Just standing there, my first day, and looking arounds at all the gear, are making Hon. Mouth watering. Toobs after toobs after toobs, big ones, small ones, rare ones. Varyable condensers, any size, any shape, and spacing. Meters, round or square, volt mil or ohm . . . toob sockets, 4, 5, 6, 7, octal, loctal, miniature . . . wire, antennas, transformers, chokes. Boy, would I like to having this for personal stockroom! I building DX farm what reely raseing cane.

Are running my fingers thru the banana plug bin with reel joy when first customer are coming in. He needing one 100 ohm quarter-what resistor. Big deal . . . must be running load tests on his ne heering-ade.

Are dusting things off, shoving crooked things strate and strate things crooked, reeding Radio Handbook, and are still awake after lunch when getting second customer. He wanting to get started in amchoor radio and could I helping out? After long confab one hour later he walking out with thirty-fiv cents beginners handbook.

That afternoon things getting even duller. Just before closing time another feller coming in. He wanting to know if I are having anything to giving away free, gratis for big awkshun at local Ham club. I giving him small package of soddering lugs and then locking up for nite. Total net profit for day one and three-thousands cents. Hon. Ed., at that rate are just covering my salary!!

Next day business are going to dogs and droppin off to new low. Not getting one customer. In factly

[Continued on page 6]

New

Heathkit VFO KIT

MODEL VF-1

\$1950

Ship. Wt. 7 lbs.

- Smooth acting illuminated and precalibrated dial.
- 6AU6 electron coupled Clapp oscillator and OA2 voltage regulator.
- 7 Band coverage, 160 through 10 meters—10 Volt RF output.
- Copper plated chassis—aluminum cabinet—easy to build—direct keying.



Here is the new Heathkit VFO you have been waiting for. The perfect companion to the Heathkit Model AT-1 Transmitter. It has sufficient output to drive any multi-stage transmitter of modern design. A terrific combination of outstanding features at a low kit price. Good mechanical

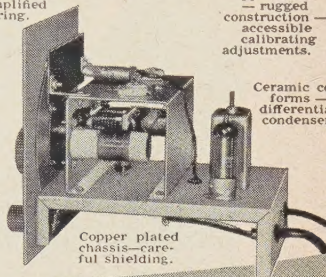
and electrical design insures operating stability. Coils are wound on heavy duty ceramic forms, using Litze or double cellulose wire coated with polystyrene cement. Variable capacitor is of differential type construction, especially designed for maximum bandspread and features ceramic insulation and double bearings.

This kit is furnished with a carefully precalibrated dial which provides well over two feet of calibrated dial scale. Smooth acting vernier reduction drive insures easy tuning and zero beating. Power requirements 6.3 volts AC at .45 amperes and 250 volts DC at 15 mills. Just plug it into the power receptacle provided on the rear of the AT-1 Transmitter Kit. The VFO coaxial output cable terminates in plastic plug to fit standard 1/4" crystal holder. Construction is simple and wiring is easy.

Open layout—easy to build—simplified wiring.

Smooth acting illuminated dial drive.

Clean appearance—rugged construction—accessible calibrating adjustments.



Ceramic coil forms—differential condenser.

Copper plated chassis—careful shielding.

Heathkit AMATEUR TRANSMITTER KIT

MODEL AT-1

\$2950

Ship. Wt. 16 lbs.

SPECIFICATIONS:

Range 80, 40, 20, 15, 11, 10 meters.
6AG7 Oscillator-multiplier.
6L6 Amplifier-doubler
5U4C Rectifier.
105-125 Volt A.C. 50-60 cycles. 100 watts. Size: 8 1/2 inch high x 13 1/2 inch wide x 7 inch deep.

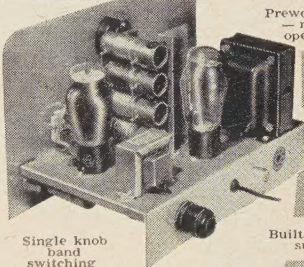
Crystal or VFO excitation.

Prewound coils—metered operation.

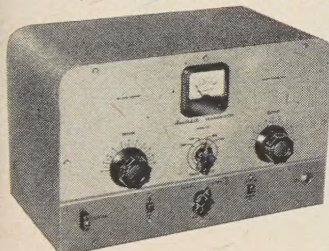
52 ohm coaxial output.

Built-in power supply

Rugged, clean construction



Single knob band switching



Here is a major Heathkit addition to the Ham radio field, the AT-1 Transmitter Kit, incorporating many desirable design features at the lowest possible dollar-per-watts price. Panel mounted crystal socket, stand-by switch, key click filter, A. C. line filtering, good shielding, etc. VFO or crystal excitation—up to 35 watts input. Built-in power supply provides 425 volts at 100 MA. Amazingly low kit price includes all circuit components, tubes, cabinet, punched chassis, and detailed construction manual.

NEW Heathkit COMMUNICATIONS RECEIVER KIT

SPECIFICATIONS:

Range.....535 Kc to 35 Mc
12BE6 Mixer-oscillator
12BA6 I. F. Amplifier
12AV6 Detector—AVC—audio
12BA6 B. F. O. oscillator
12A6 Beam power output
5Y3GT Rectifier
105-125 volts A.C. 50-60 cycles, 45 watts.

A new Heathkit AR-2 communications receiver. The ideal companion piece for the AT-1 Transmitter. Electrical bandspread scale for tuning and logging convenience. High gain miniature tubes and IF transformers for high sensitivity and good signal to noise ratio. Construct your own Communications Receiver at a very substantial saving. Supplied with all tubes, punched and formed sheet metal parts, speaker, circuit components, and detailed step-by-step construction manual.

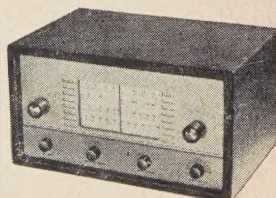
MODEL AR-2

\$2550

Ship. Wt. 12 lbs.

CABINET:

Proxylon impregnated fabric covered plywood cabinet. Ship. weight 5 lbs., Number 91-10, \$4.50.



Six tube transformer operation.

Electrical bandspread and scale.

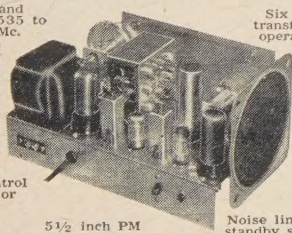
Noise limiter—standby switch.

5 1/2 inch PM Speaker. Headphone Jack.

Four band operation 535 to 35 Mc.

Stable BFO oscillator circuit.

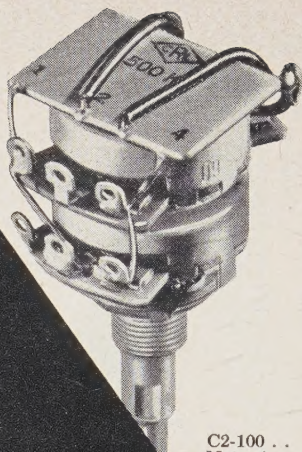
RF gain control with AVC or MVC.



HEATH COMPANY
BENTON HARBOR 6, MICHIGAN



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Centralab's
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COMPENTROL®
lets you hear
the **full range**
of the
orchestral
score

The deepest tones of the bass tuba



Senior Compentrol — with special Printed Electronic Circuit*—is no ordinary compensated control. There's nothing else like it, for improving the tone performance of hi-fi amplifiers or pre-amplifiers! *Level-set* lets you control compensation to suit yourself. Ask your Centralab distributor. Write Centralab, Dept. 911K, Milwaukee 1, Wis. for Compentrol booklet.

*Trademark

Centralab

D-155A

[from page 6]

walking down into basement with him to show him stock of mystery toobs.

You knowing, Hon. Ed., that stranger are by almost five-hundred mystery toobs—gracious to goodness, that are a small forshun. And to thinking Hon. Owner are redly to scrapping same!

He are so happy he telling me that anything want in store are mine, up to five-hundred worth!! Wowiee! A free charge account. Whe finish my new rig I can Working All Zones bl folded with one arm.

How's that, Hon. Ed., you are not understand about mystery toob? Easy. You seeing, it not a t at all. It are speshul high-whattage projecshun la for using in stage liteing, and on acct. not made more, but having many projectors still-in use, la are worth its wate in radioactive bubble-gum.

Respectively yours,
Hashafisti Scratchi

Ham In The Industry



Rush S. Drake, W4ESK, well-known DX contest participant (and winner) has returned to the State of Washington. Rush has recently been appointed a Field Engineer for EIMAC tubes in a territory that will include Washington, Oregon and parts of Idaho and Montana.

Rush has been licensed since 1933 (as W7ES) and is a graduate of the University of Washington in E.E. He served in the U.S. Navy during both the Korean conflict and World War II, with the rank of Commander in the U.S.N.R.



Leon A. Wortman, W2LJU, popular Ham journal and radio trade writer has been appointed sales manager of the J. C. Warren Corp., Freeport, L.I. The Warren Company is a manufacturer of specialized tape recorders which under the direction of W2LJU will greatly enlarge its field. Leon was most recently the national advertising and sales promotional manager for the RCA tape recorders and high components.

In the commercial field Leon has also been associated with A-V Tape Libraries, Fairchild Recording Equipment and Audio-Video Recording Co.

PR

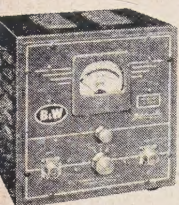
CRYSTALS

**AIRCRAFT-MARINE
BROADCAST-POLICE
FIXED SERVICES
AMATEUR-DIATHERMY
FREQUENCY STANDARD
MOBILE-INDUSTRIAL**



PETERSEN RADIO COMPANY, INC.
2800 W. BROADWAY • COUNCIL BLUFFS, IOWA

EXPORT SALES: Royal National Company, Inc., 75 West Street, New York 6, N. Y., U. S. A.
November, 1954 • CQ • 9



MATCHMASTER

Models 650 and 651

A Dummy Load, R-F Watt Meter, SWR Bridge, All in One

Here's the instrument you asked for. And once you've tried it, you'll wonder how you ever got along without it. It provides, in one completely self-contained cabinet, 6" x 8" x 8",—

A Dummy Load—for all kinds of tests on your transmitter without putting a signal on the air. Maximum SWR 1 to 1.2 over a frequency range of 300kc to 30mc.

A Direct-Reading R-F Watt Meter—for precise adjustments of all r-f stages up to 125 watts, and even higher powers by sampling. Excellent repeat accuracy over full 125 watt scale.

An Integral SWR Bridge—for matching antennas and other loads to your transmitter, giving you precise adjustment of beam antennas, antenna matching networks, and mobile whip antennas.

Controls—including a 3-position function switch, and a meter adjusting knob—are conveniently grouped on the attractive, silk-screen-ray front panel, which also contains a 3-inch calibrated meter, and Type SO239 input and output connections. The ventilated steel cabinet is finished in attractive blue Hammertone. Two types are available;

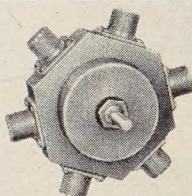
Model 650: 52-ohm line—Model 651: 73-ohm line or details, write for descriptive Bulletin 650.



AUDIO PHASE SHIFT NETWORK

Type 2Q4—Model 350

This octal based, audio phase shift network provides a constant 90° phase shift, $\pm 1.5^\circ$, over the audio range of 300 to 3000 cycles, yet requires no more space than a 6J5 tube. Designed especially for single sideband receiving and transmitting applications.

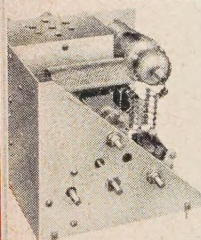


MULTI-POSITION COAXIAL SWITCH

Model 550

Takes The Mess Out of Switching Circuits

At last you can have an inexpensive, multi-position coaxial type switch—for selecting antennas . . . transmitters . . . exciters . . . receivers . . . and other r-f generating devices using 52-75 ohm coaxial line—without fumbling or breaking your back trying to screw and unscrew connections. This B&W Model 550 is equipped with six SO239 type connections for selecting any one of five 52 or 75 ohm lines. It will handle 1kw of modulated power with a maximum crosstalk of -45db at 30mc. Housed in a heavy, 4" diameter aluminum case, the Model 550 is made for single hole mounting.



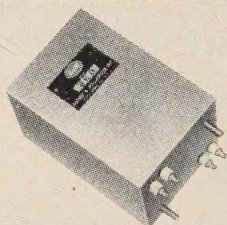
MULTI-BAND FREQUENCY MULTIPLIER

Model 504C

Gives You Any Band At The Flip of a Switch

Here is a newly conceived and designed exciter unit that makes transmission on any band available at the flip of a switch. Compact in its 8" x 8" x 9 1/2" size, the Model 504C covers the 80 through 10 meter bands with a nominal power output of 25 watts from the 807 amplifier stage through a flexible pi-network output circuit. Its broad band type amplifiers require no tuning, and the unit comes equipped with four 6AQ5's to make up its multiplier string. An external EO or crystal oscillator (80 meter fundamental) required, as well as a suitable power supply. Ruggedly constructed of heavy gauge frosted aluminum, the Model 504C also makes an ideal basic mobile foundation unit for multi-band operation.

O N T H E

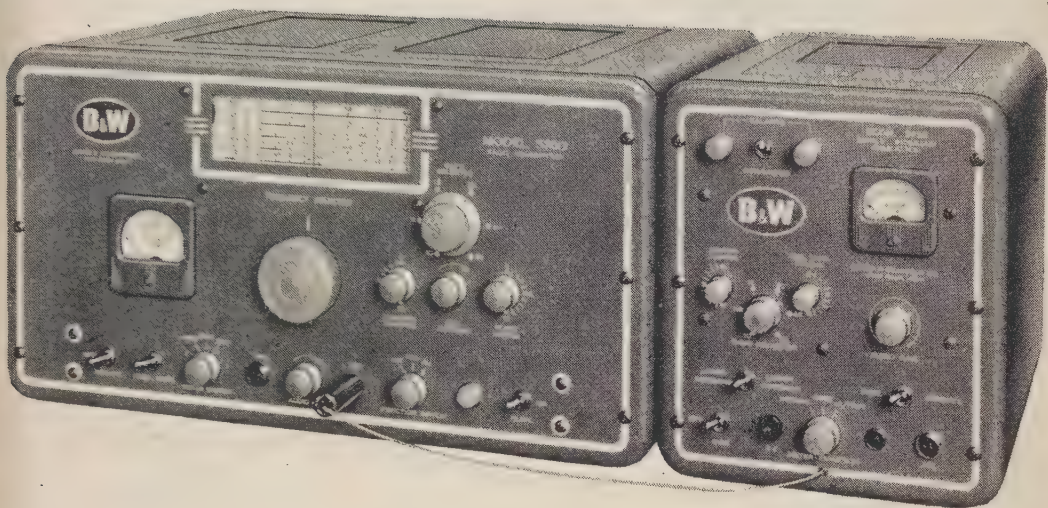


PRECISION TOROIDAL TYPE SSB BANDPASS FILTER

Model 360 and 361

Here is a precision bandpass filter valuable for use in heterodyne type sideband generation. Containing eight toroidal type coils in an LC type filter, it is designed to pass the frequencies 16.9 to 20kc. Extreme skirt attenuation. Two types are available: a receiving type (Model 360) for 20,000 ohm input and output; and a universal transmitting or receiving type (Model 361), for 20,000 ohms input and an output of 20,000 ohms unbalanced, plus two 500 ohm balanced outputs. Both types are precision adjusted and housed in hermetically sealed, tinned steel cases measuring 2 5/8" x 2 1/4" x 3 3/4", exclusive of mounting studs and terminals. Write for Bulletin 360.

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A I R W I T H

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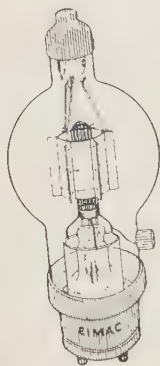
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These are just a few of the hundreds of products especially designed and built by B&W to meet the needs of the radio amateur. Others are described in Catalog 2PC available upon request. Write for your copy.

AD #1: NOVEMBER 1934

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Characteristics:
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Fil. Voltage	5 V.	Fil. Current	10 A.
Rated Plate Dissipation	150 W.	Amp. Factor 13	Max. Plate Current 200 MA.
Plate Voltage	1000	2000	3000
Plate Resistance	2750	1900	1250
Mutual Conductance	5800	7300	1200
Normal Power Output (75% eff.)	150W.	300W.	450W.

PRICE \$24.50. Sold Only by Reputable Dealers.

HERE is a tube, new and original in design. It fulfills the most severe requirements of amateur practice. High output is obtained with low grid driving power and low plate voltages. Exceptionally high vacuum increases usable filament emission and prolongs tube life. Tantalum grid and plate construction permits maintenance of high vacuum even when overloaded. Extremely low inter-electrode capacities make for high efficiency at high frequencies. Isolated grid and plate leads, in con-

junction with elimination of internal insulators, insure freedom from arc-over or break-down. Low voltage double-V filament reduces hum, increases mutual conductance, and life and increases mutual conductance. The large NONEX envelope, free from discoloration, allows maximum heat radiation without bulky physical dimensions. Improved 50-watt base insures rigidity and freedom from short-circuiting. "Ghost" grid structure minimizes electronic shadowing effects on the plate.

More POWER per dollar! Fewer dollars per hour of useful life! The result of six years' experience exclusively building transmitting tubes for ship, mobile, portable and amateur use. Unconditionally guaranteed to be gas-free, and against mechanical defects for two years.

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In November, 1934, the above advertisement introduced Eimac tubes to the amateur radio world. In those days, keeping a rig on-the-air wasn't easy. In fact, because it was just plain frustrating, this first Eimac ad came about. Bill Eitel, W6UF, and Jack McCullough, W6CHE, like thousands of other enthusiastic hams, were dissatisfied with the short life, lack of dependability and performance of electron-power vacuum tubes of the day. Rather than live with the problem, they decided to do something about it. In short they made a power triode without troublesome internal insulators, used metals with low gas absorbing capacities as electrodes and perfected thorough pumping techniques. The tube, de-

signed specifically for the amateur radio operator, was called the 150T. What has happened since then has made Eimac the largest manufacturer of transmitting tubes in the world. Eimac triodes, tetrodes, pentodes, klystrons have been continuously specified for all types of commercial and military service. But the amateur radio operator has not been forgotten. Month after month since the Eimac ad, you have been kept informed about Eimac tube developments and applications. Today, with 69 amateur radio operators in the organization, including W6UF and W6C, president and vice president-treasurer, respectively, Eimac illustrates the importance of amateur to electronic progress.

Eimac

EITEL-McCULLOUGH, INC. SAN BRUNO, CALIFORNIA
The World's Largest Manufacturers of Transmitting Tubes

Table Topper



for
TWO

Edwin T. Kephart, W2SPV

W2SPV was licensed in January 1936 with the call W3GA1. Ed has done considerable writing and photography work for CQ and allied publications. At the present time W2SPV is mainly interested in 10 and 2 meters, but has started to lean towards 75-meter SSB. Active on RTTY and mobile on all bands. Ed is past-President of the South Jersey Radio Association and is now their Recording Secretary. Works for the U.S. Government in the Aviation Medical Acceleration Laboratory, NADC, Johnsville, Pa. as an electronic scientist. Married, one son. Mailing address: 4309 Willis Ave., Merchantville, N.J.



the cost of a high level modulator. Despite the poor reputation which screen-modulation systems have gained—due to careless design and operation of some transmitters—screen-grid modulation *can* produce high-quality results. No separate modulator power supply is required and the full power requirements for a modulation system of this type can usually be obtained from the r-f exciter supply.

Circuit Description

The design of the rig shown in the block diagram, *Fig. 1*, is based on the aforementioned principles. The r-f exciter section uses only three tubes in a simple, rugged and time-tested arrangement. It is basically the same as the low-power "Novice" transmitter r-f section.⁴ A modified Pierce crystal oscillator 6AG7 (*V1*) uses an 8-Mc. crystal operating on its fundamental mode. The oscillator plate circuit is tuned to 24 Mc. and drives a 6AG7 (*V2*), tripling to 72 Mc., which in turn drives a 2E26 (*V3*) as a doubler to 144 Mc. Energy from this stage is link coupled to the tuned grid circuit of the final amplifier stage, a 5894 (*V4*). The antenna

Many Hams now operating in the two-meter band with surplus v-h-f equipment or simple rigs have been known to become discontent with their low power—but after considering the cost of power supplies and high-level modulation equipment have elected to remain in the low power class. For high level modulation of 100-watt carrier the modulator must produce at least 50 watts of audio and often its cost, plus the cost of a suitable modulator power supply, is equal to or more than that of the r-f section of the transmitter. The problem then is how to get into the high-power r.f. class and still remain in the low power money class.

Screen modulation^{1,2,3} offers one possibility of obtaining high r-f power and side-stepping

1. "A System of Gating Modulation," C. O. Bishop, CQ, Oct., 1952, page 19.
2. "Some Experiments with Screen Grid Modulation," Frank C. Jones, CQ, Jan., 1952, page 13.
3. "Further Experiments with Screen Modulation," Frank C. Jones, CQ, Dec., 1952, page 17.
4. "Getting on Novice Phone," E. M. Brown and E. T. Kephart, CQ, (part I), December, 1952, p. 28; (part II) January, 1953, p. 23.

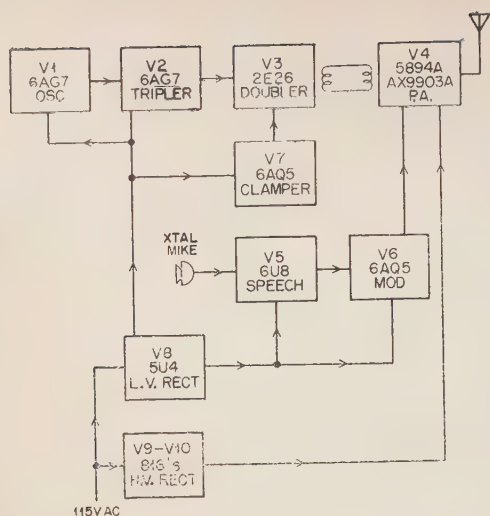


Fig. 1. Block diagram of the transmitter.

feed line is link-coupled to the final tank coil. A 6AQ5 (V7) is used as a clamp tube to protect the 2E26 in the event of excitation failure. The 6U8 (V5) is used as a speech amplifier and an a-f driver. This dual purpose tube provides adequate gain for use with a high-quality crystal or high impedance dynamic mike. A 6AQ5 (V6) serves as the "gating" modulator¹ for the screen of the 5894. No clamp tube was deemed necessary for the protection of the final stage.

The nature of the *gating* system of modulation is such that d.c. and audio-frequency voltages are applied to the screen grid of the stage being modulated through the 6AQ5 modulator. The operating screen-grid voltage of the 5894 is controlled by a resting carrier control. When this control is set for proper modulation characteristics, the screen voltage is low enough that the 5894 is more-or-less protected. If it true that if excitation is lost during a QSO, the screen voltage will still be applied and will vary with modulation. However, if one occasionally checks his r-f output or the grid drive to the final during a QSO it is doubtful whether a damaging failure would occur. Protection can be afforded during tune-up by controlling the screen voltage to the final by retarding the resting carrier control and holding the plate current to a safe level during the tune-up period.

Two of the newer tubes on the market have been incorporated in this rig. The 6U8 is a triode-pentode design for use as a local oscillator-mixer and other combined functions in FM and TV receivers. Its characteristics are sufficiently similar to the popular 6AU6-6C4 speech/driver combination to lead to its use as the speech amplifier and a-f driver. The compact construction and short internal leads make

it easier to eliminate effects of r.f. in the speed system.

The r-f output stage uses an AX9903A/5894. One advantage of this tube is that it does not normally require neutralization at 144 Mc., the proper precautions against stray plate-to-grid feedback are observed. Small neutralizing condensers have been incorporated in the tube during manufacture. The 829 or 3E29 series can also be used in this rig, however it will be necessary to neutralize the stage, by using criss-cross neutralizing wires, in the familiar fashion.^{5,6}

One of the difficulties commonly encountered with tubes at v.h.f. involves cathode lead inductance effects. The lead within the tube and the external connections to ground are often long enough to make the tube unstable in its operation. This tendency can be minimized by "de-Q-ing" this cathode lead inductance. Instead of using a length of wire for the cathode-to-ground connection we made this connection through four 10-ohm, 1/2-watt carbon resistors connected in parallel. (Do not use wire wound resistors here, as these have inductance and may act as r-f chokes!)

Power Supply

Two power supplies are required. One, a low-voltage supply using a 5U4 rectifier and a brute-force filter, provides 350 volts at 120 ma. This supplies power for the exciter, speech stages, and final amplifier screen. The high power plate supply provides 600 d-c volts at 220 ma. and uses a single-section choke-input filter and a pair of 816 rectifiers. Separate filament transformers are provided for the 816 filaments and the 5894 filament. Both plate supplies have bleeder resistors across their output for safety.

Transmitter Layout

The general arrangement and construction may be seen in the top and under chassis views of the transmitter. The whole rig, including all power supplies, is built on a 17"x13"x2" chassis. A 10 1/2" aluminum rack panel is fitted to the front edge of the chassis by means of 11-inch side brackets. The unit may be mounted in a desk-type rack cabinet. This arrangement provides a complete and compact transmitter that may be made portable by the addition of a pair of handles.

The power supplies occupy the rear portion of the chassis and the r-f section the front. The final amplifier plate tank condenser is mounted above the chassis on ceramic stand-off pillars of sufficient height to bring the stator terminals in line with the plate terminals of the 5894. The p-a tank coil, L7, is mounted on the same terminals.

5. "A VHF Amplifier Using the 829," QST, March, 1946, p. 55.
6. "144 Mc. Double Beam Tetrode Power Amplifier," ARRL Handbook, 23rd through 27th editions.

minals as the plate connectors. The output link, *L8*, is supported on a *National FWH* terminal strip supported from the p-a condenser frame.

The rigs "tune/operate" switch, *Sw2* disconnects the p-a power and the screen supply to the final stage when in the tune-up position. The "transmit" switch, *Sw3*, provides for front-panel switching of the transmitter during tune-up or local control. Terminals are provided on the rear edge of the chassis for a push-to-talk switch, or for remote control. Your author chooses to use a foot switch which he found to be a boon to operating during a contest or net drill. A receptacle is also provided for a remote antenna change-over relay. Three meters are incorporated in the rig to read plate and grid currents. A 0-100 ma. meter, *M1*, reads plate current to the 2E26 (*V3*). A 0-5 ma. meter, *M2*, is used to read grid current to the 2E26 and the final. A SPDT toggle switch connects the meter across *R7* (100 ohms) for reading the grid current of the 2E26 doubler; or across *R11*, which serves as a meter shunt, so the meter reads full scale when 10 ma. grid current flows in the final grid return circuit. A 0-200 ma. meter, *M3*, reads plate current to the 5894 (*V4*) at all times. Experience has shown that it is not necessary to meter the plate and grid currents of the low-power r-f stages.

The resting carrier control is not mounted on the front panel as this control is usually set and left in that position. The front panel controls may be identified from the front panel view and only the necessary controls for opera-

tion are brought out to the front panel. Output terminals are located along the back edge of the chassis.

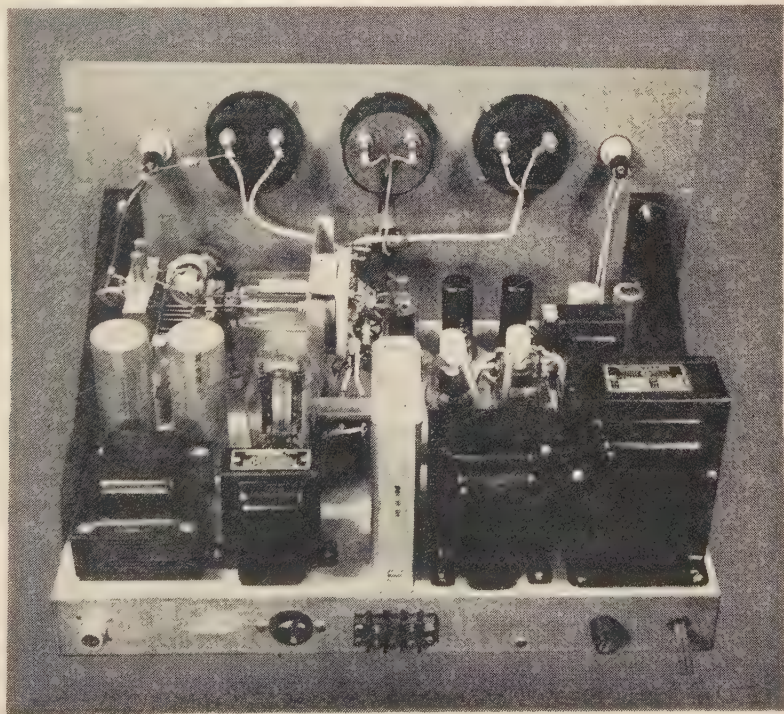
Construction

The construction of the transmitter is straightforward and simple. The usual precautions for intercoupling and the prevention of feedback should be observed. All leads must be as short and direct as possible. Only power, control and filament leads may be cabled. The photographs clearly show the general wiring details. It is suggested that the parts be laid out and arranged before any drilling is done. The arrangement of *V1*, *V2* and *V3* may be taken from the chassis drilling plan of the "Novice" transmitter,⁴ as the same geometric arrangement was used for the exciter section.

The 5894 socket is mounted on a vertical tube shelf which may be formed from a piece of scrap metal in accord with *Fig. 3* or fabricated by soldering stiffeners to a *Bud #CB523* chassis deck. This arrangement allows for short lead lengths in the grid and plate circuits and provides shielding between the grid and plate circuits. The p-a grid coil, *L6*, is mounted directly across the grid terminals of socket *V4* and *C4* is soldered across the coil leads. Link, *L4-L5*, is self supported and is made from a length of insulated hook-up wire. It is fitted between the turns of *L3* and *L6* and held in place with a drop of *Duco Cement*, or coil dope.

Connection is made between the plate leads of the 5894 (*V4*) and *C5* with short lengths of flexible copper lead or thin strap fitted with spring wire clips, *Birnbach cat #32A*. Choke,

General arrangement view of the transmitter as viewed from the rear. The high voltage power supply is in the right foreground and the lower voltage supply is in the left foreground. The meters, from left to right, are *M3*, *M2* and *M1*.



Coil Data

- L1—7 turns, $\frac{5}{8}$ " diameter, 16 turns per inch (B&W Miniductor #3007).
 L2—7 turns, $\frac{1}{2}$ " diameter, 16 turns per inch (B&W Miniductor #3003).
 L3—5 turns, $\frac{5}{8}$ " diameter, #12 AWG spaced 2" (see text).
 L4-L5—2 turn link, $\frac{5}{8}$ " diameter, insulated hook-up wire (see text).
 L6—2 turns $\frac{5}{8}$ " diameter #12 AWG spaced 1" (see text).
 L7—2 turns, $\frac{3}{4}$ " diameter #12 AWG spaced $1\frac{1}{2}$ " (see text).
 L8—2 turns, $\frac{3}{4}$ " diameter #16 AWG insulated with spaghetti close wound, (see text).
 RFC1—7 turns, #20 AWG close wound on #28 drill (see text).

RFC3, is an Ohmite Z50, supported between the center tap of L7 and an insulated feed-thru bushing mounted beneath V4. As mentioned previously, the p-a tank condenser C5 is mounted on ceramic pillars and is mounted upside down on the pillars with an angle clip at each corner. This arrangement brought the stator terminals in line with the plate pins of V4, however, the shaft of the condenser, if brought through the front panel at this point, will not provide a symmetrical layout of the panel. The shaft was fitted with a 1-to-1 gear train which allowed for a more symmetrical panel layout. This could also have been accomplished with a pair of dial pulleys and cord.

A length of co-ax, RG59/U, feeds the r-f output from the link to the output receptacle on the rear lip of the chassis. R.f. is also fed to the r-f output indicator on the front panel thru a short length of RG59/U. The coupling to the r-f indicator system is adjusted by C17.

Coils

All coils for the rig are either home-made or fabricated from B&W miniductors. L1 consists of 7 turns of B&W miniductor #3007, and is constructed as follows: Cut off $7\frac{1}{2}$ turns from the coil with a sharp knife or fine saw. Loosen $\frac{1}{4}$ turn from each end and straighten out. The coil is self supporting and mounts between stator terminal of C1 and insulated terminal strip at junction of R2 and R28. L2 consists of 7 turns of B&W miniductor #3003 and is fabricated in the same manner as L1. RFC1 must be home made, and is wound as follows: Wrap 7 turns of #20 AWG copper wire around the shank of a #28 drill, leaving one-inch at each end. Remove coil from drill. Bend one lead at right angles to coil and cut off to $3/16$ ". Solder this end to the center turn of L2. Trim the other end short, tin and solder assembly in the circuit between C2 and ceramic pillar at terminus of C9. The short tinned end of RFC1 connects to terminal 6 of socket V2.

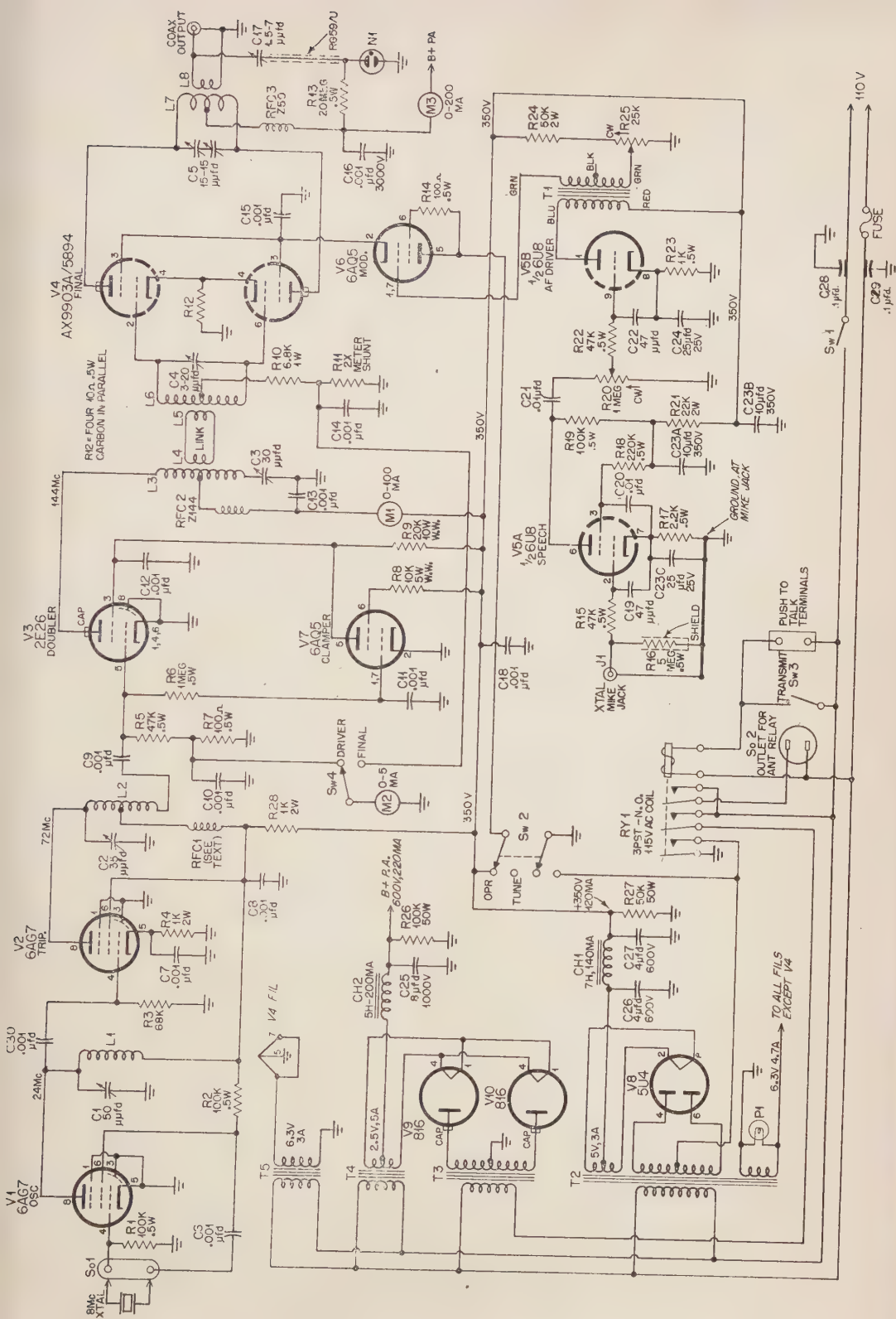
Coil L3, consists of 5 turns of #12 AWG tinned or enameled solid wire (antenna wire), $\frac{5}{8}$ " in diam. Wind the 5 turns around a wood dowel $\frac{5}{8}$ " in diam., leaving ends of coil 2" long. Bend leads at right angles to coil and stretch out coil to make it 2" long. Fit coil L3 between

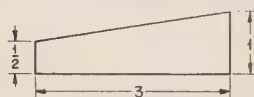
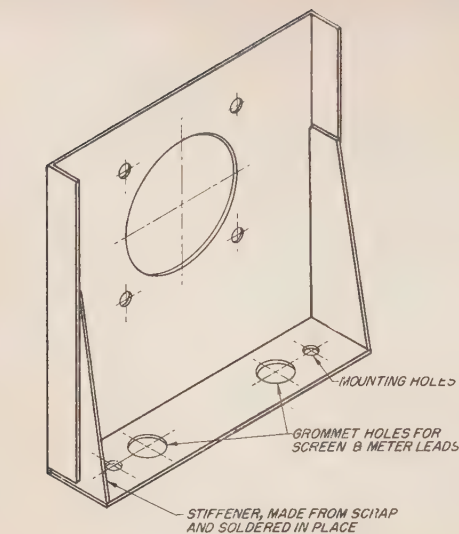
plate cap of the 2E26, through a grommet hole in the chassis, to the stator of C3. CAUTION—Do not apply force to plate during the "fitting"—the 2E26 glass envelope is quite fragile! RFC2 is mounted between center turn of L3 and an insulated tie point mounted under one of the socket mounting bolts. L6 consists of 2 turns of #12 AWG wire wound on a $\frac{5}{8}$ " mandrel and spaced to occupy 1". Leave 2 leads about $1\frac{1}{2}$ " long, to start. Bring leads out from coil to about $\frac{1}{2}$ " then turn at right angle to coil. The coil is self-supported from the grommet terminals of socket V4. After mounting the coil trim ends. C4, as previously mentioned, is mounted directly across leads to coil. R1 is mounted between center turn of L6 and an insulated tie point mounted conveniently on the vertical tube bracket supporting the 5894.

Link, L4-L5, is made from a length of insulated hook-up wire. Take a two-foot length of wire and form a 2-turn coil with an inside

- C1—50 μ fd., air variable, Hammarlund HF-50.
 C2—35 μ fd., air variable, Hammarlund HF-35.
 C3—30 μ fd., air variable, double spaced, Hammarlund HF30X.
 C4—3-30 μ fd., trimmer, BUD 833.
 C5—15/15 μ fd., dual variable, Cardwell NP-15-ND.
 C16—0.001 μ fd., 3000-volt disc ceramic, Erie 3KV-102.
 C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C18, C30—0.001 μ fd., disc ceramic, Erie 811.
 C17—1.5-7 μ fd., trimmer, Erie Ts2a-1.5.
 C19, C22—47 μ fd., tubular ceramic.
 C20, C21—0.01 μ fd., disc ceramic.
 C23a/C23b/C23c—10 μ fd./350v./10 μ fd./350v./25 μ fd./25v., electrolytic.
 C24—25 μ fd., 25v., electrolytic, CD Blue Beaver.
 C25—8.0 μ fd., 1000v., CD type T3U 10080.
 C26, C27—4.0 μ fd., 600v., CD type TLA 6040.
 C28, C29—0.1 μ fd., 250 v.a.c., Sorague Hi-Pass #28P9.
 Ch1—Filter choke, 7 henries, 140 ma., Stancor C1421.
 Ch2—Filter choke, 5 henries, 200 ma., Stancor C1646.
 M1—Milliammeter, 0-100 ma., Simpson model 27.
 M2—Milliammeter, 0-5 ma., Simpson model 27.
 M3—Milliammeter, 0-200 ma., Simpson model 27.
 N1—Pilot light socket with neon lamp NE51.
 R1, R2, R19—100,000 ohms, $\frac{1}{2}$ w.
 R3—68,000 ohms, $\frac{1}{2}$ w.
 R4, R28—1000 ohms, 2w.
 R5, R15, R22—47,000 ohms, $\frac{1}{2}$ w.
 R6—1.0 megohm, $\frac{1}{2}$ w.
 R7, R14—100 ohms, $\frac{1}{2}$ w.
 R8—10,000 ohms, 5w., wire wound.
 R9—20,000 ohms, 10w., wire wound.
 R10—6800 ohms, 1w.
 R11—2X meter shunt to suit meter resistance.
 R12—Four 10-ohm, $\frac{1}{2}$ w. resistors in parallel.
 R13—20.0 megohms, $\frac{1}{2}$ w.
 R16—5.0 megohm, $\frac{1}{2}$ w.
 R17—2200 ohms, $\frac{1}{2}$ w.
 R18—220,000 ohms, $\frac{1}{2}$ w.
 R20—1.0-megohm potentiometer, IRC type Q.
 R21—22,000 ohms, 2w.
 R23—1000 ohms, $\frac{1}{2}$ w.
 R24—50,000 ohms, 2w.
 R25—25,000-ohm potentiometer, IRC type Q.
 R26—100,000-ohm, 50-watt, wire wound, IRC type PWW.
 R27—50,000-ohm, 50-watt, wire wound, IRC type PWW.
 RFC1—See coil table.
 RFC2—Ohmite Z-144.
 RFC3—Ohmite Z-50.
 Ry1—Relay, 3-pole, 115 v.a.c. coil, Advance 979B.
 Sw1, Sw3—Switch, SPST.
 Sw2—Switch, DPDT.
 Sw4—Switch, SPDT.
 T1—Audio interstage, 1:3 ratio, Stancor A63C.
 T2—Power transformer, 360-0-360v., 120 ma., Stancor PM810.
 T3—Power transformer, 600-0-600v., 225 ma., Stancor PC8303.
 T4—Filament transformer, 2.5v., 5 amp., Stancor P-8183.
 T5—Filament transformer, 6.3v., 3 amp., Stancor P-5014.

Fig. 2. Wiring schematic and complete parts list of the "Table-Topper" 144-Mc. transmitter.





STIFFENER 2 REQUIRED #24 GAUGE
COPPER, BRASS OR SHEET STEEL

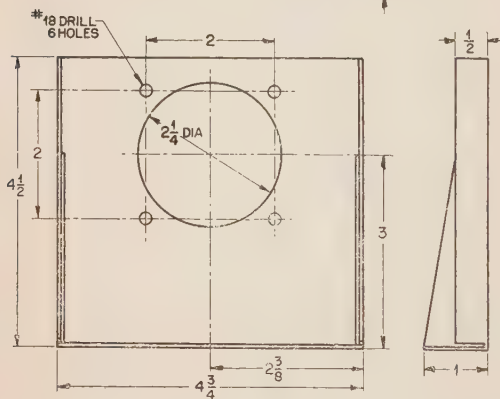
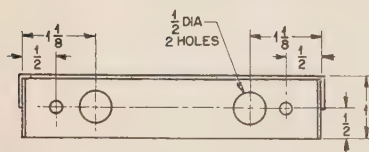


Fig. 3. Mounting plate and tube shelf for the
5894 final amplifier. See photographs for ad-
ditional details.

diameter of $\frac{5}{8}$ " and leaving a free end of 3". Fit this coil in between the center turns of $L3$, shape wire to center of $L6$ and in the long free end form another 2-turn coil fitting this coil to center of $L6$. Measure length needed to complete the circuit between the coils and snip off. Remove coils, slip a short length of spaghetti over wire, solder and slide the spaghetti over the splice. Reshape coils, mount them in place, closely coupled to $L3$ and $L6$, and tack in place with a drop of Duco Cement.

The p-a tank coil $L7$ is also wound from #16 wire and consists of 2 turns, $\frac{3}{4}$ " in dia stretched out to a space of $1\frac{1}{2}$ ". An eye formed in each end of the coil to fit the stat bolts on $C5$. $RFC3$ is soldered to the center point of the coil before installing on the condenser. The antenna coil, $L8$, must be well insulated, by sliding spaghetti over the piece #16 wire from which the coil is wound. The self-supported coil consists of 2 turns close wound on a $\frac{3}{4}$ " mandrel. This coil is fitted between the center turns of $L7$ and mounted the "output" binding posts as may be noted in the photograph. This coil may be adjusted by bending the coil on its own leads.

Tuning and Adjustment

Before attempting to try out the transmitter for the first time, it is suggested that all wiring be checked against the schematic, and that no free wire ends are shorting-out any of the tube socket pins or components.

Turn on the Power switch and allow the tube filaments to come up to operating temperature. Turn the resting carrier control ($R2$) fully counter-clockwise. Plug in the 8-M crystal (8.000 to 8.222). Throw "tune/operate" switch to TUNE and grid meter switch to DRIVE. A current reading of about 5 ma. should be noted on meter $M1$. Rotate $C1$ and near mid-range there should be a kick in grid current, tune for maximum. Rotate $C2$. Near the minimum capacity setting there should be a further increase in grid current, along with an indication of plate current to the 2E26 (read on $M1$). Re-tune $C1$ and $C2$ for maximum grid drive $V3$. This should be in the vicinity of 1.5 to 2 ma. Tune $C3$ to resonance bringing plate current to minimum on $M1$. If one cannot get at least 1.5 ma. grid drive, try squeezing or stretching the turns of $RFC1$ slightly. Try moving the center tap a little each way. Try swapping $V1$ and $V2$ and check to see that the cathode lead and grounds of $V1$ and $V2$ are not too long. It might also be wise to check the frequency of the exciter stages at this point. This may be done either with a grid-dip meter or an absorption wave meter.

Throw the grid meter switch $S4$ to the FINAL position and tune $C4$ with an insulated screwdriver for maximum reading on $M2$. Re-pea $C3$. It might be necessary to adjust the position of the links with respect to $L3$ and $L6$ to bring the reading to maximum. Maximum grid current should be in the vicinity of 10 ma. (full scale).

Before attempting to tune the final, it must be loaded with either an antenna or dummy load. Tightly couple $L8$ to the final plate tank. Return the "tune/operate" to the OPERATE position and throw the TRANSMIT switch or Rotate $C5$ and tune for maximum purple glow in the neon output indicator $N1$. Keep increasing the coupling of $L8$ to $L7$ until no further

increase in brilliance in the output indicator can be noted. Adjust *C17* until the lamp has just sufficient glow to indicate output. In this way the lamp will reach its maximum brilliance on modulation peaks.

The resting carrier control (*R25*) may now be advanced to increase the resting carrier to about 90 ma., an increase in the brilliance of the output indicator should also be noted. The p-a plate current should kick up to about 120 ma. on loud voice peaks with full modulation. The audio gain control (*R20*) should be advanced to a point where there is an increasing swing in final plate current of about 10 to 15 ma. with normal speech. A better check may be made by listening to the signal on a monitor or a grid dipper, or by using an oscilloscope to adjust for best modulation waveform.

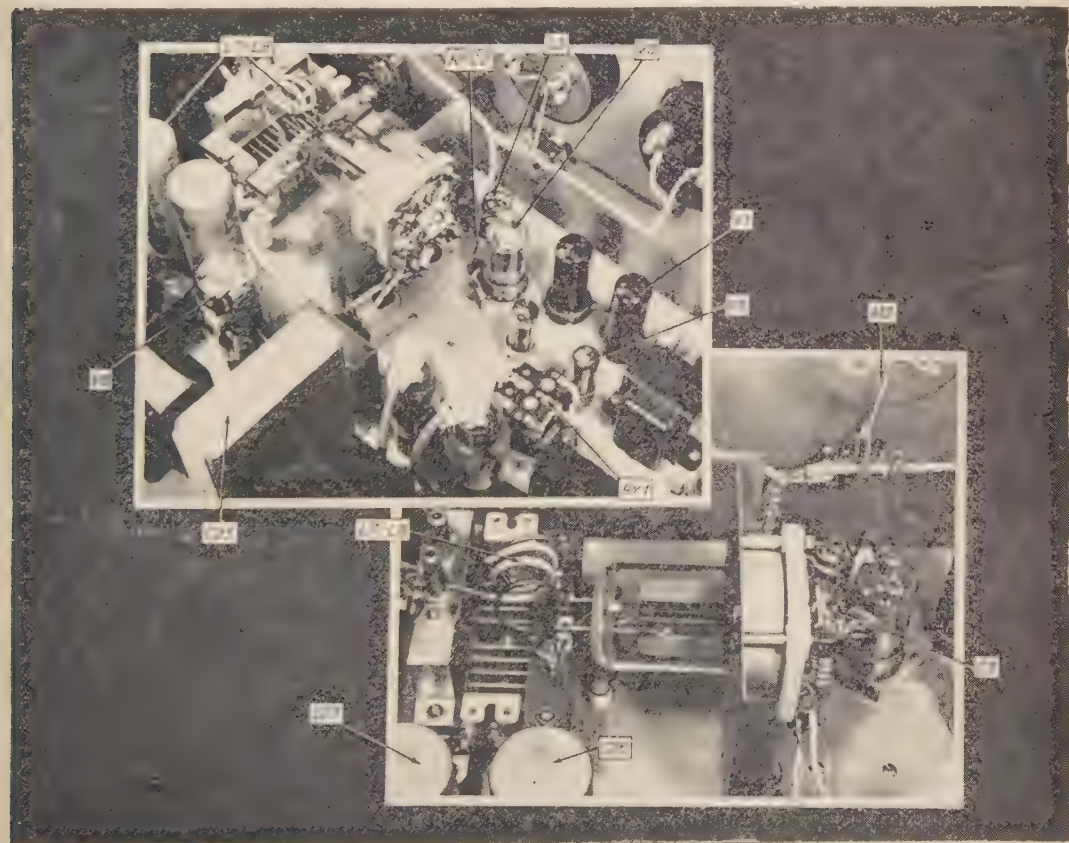
Conclusion

As one might observe in comparing the photographs and the parts lists, some of the components used in our model are not identical with those called for. The final plate transformer *T3* and the audio interstage transformer *T1* are pre-war units. Your author had them on hand and, as long as they matched the modern counterparts, made use of them. The

parts list specifies parts found currently on the radio parts distributors shelves. Quite a bit of freedom in the choice of the transformers may be exercised, however, one must remain within the general specifications.

About TVI. This rig has been in operation for the past year without any complaints from TV viewers in the neighborhood. A *Sylvania* 12" continuous tuning TV receiver is used in the shack as a monitor. No outside antenna is used as the built-in antenna gives sufficient pick-up to monitor the three local channels. An *Olympic* 19" receiver, with an outdoor antenna, is used by the XYL. No TVI is experienced in either receiver. A bottom cover, not shown in the photographs is installed on the chassis before the unit is installed in the cabinet.

This rig is capable of generating about 25-watts of useful carrier power *output*. The modulation is 100% on both positive and negative peaks with surprisingly high quality and negligible splatter. Although this may seem like a modest claim on power output, it represents a big gain over the output of most commercially-available two-meter jobs, and the popular surplus rigs.

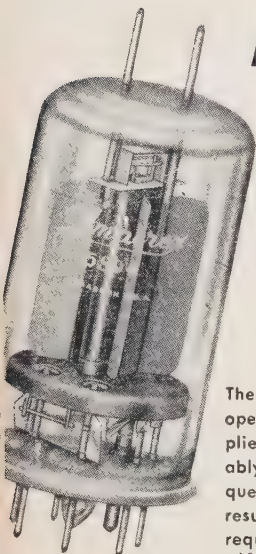


Views of the mounting arrangement around the 5894. Note that link L4/L5 has been removed in one photo to show detail of the final grid coil L6. All grid and cathode components are grouped around the socket base.

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The 5894 is a UHF and VHF twin tetrode for wide-band operation, RF amplifier, modulator, frequency multiplier service and wide-band oscilloscopes. Considerably reduced capacities provide higher resonant frequencies. Single cathode and screen grid construction results in low RF degeneration, therefore low drive required. Self-neutralized over entire band. Only 4" x 1 $\frac{1}{4}$ ". This tube has proved to be outstanding with 5 years of actual mobile operation.

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PLATE VOLTAGE.....750
ANODE DISSIPATION.....45 w
HALF FILAMENT BATTERY DRIVE
ON "STANDBY"

ACTUAL MEASURED POWER OUTPUT

PUSH-PULL OPERATION

144 Mc.....	85 w
220 Mc.....	85 w
420 Mc.....	60 w



Amperex type 6155—Tetrode

Replaces old type 4-125A. Features heavy, zirconium coated graphite anode for high overload capacity. Powdered glass stem for strength eliminates external "heat-trap" base.

Amperex type 6156—Tetrode

Replaces old type 4-250A. Same features as 6155. Proven outstanding in high frequency communication and amateur service.

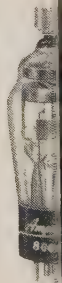


Amperex type 6360—Twin Tetrode

High Power At Low Cost! A small, low-cost, efficient twin tetrode, (only 3" x $\frac{7}{8}$ "). Highly efficient for operation at up to 200 Mc. Excellent frequency multiplier for 2 meter and 220 Mc bands.

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In the September issue this article plunged fearlessly into the home construction of a keyboard for teletype and CW transmission. The author described how it could be done using the junked remains of an old typewriter. The second part, printed herein, describes the coding matrix and pulse storage system.



the "Junkeyboard"

John E. Williams, W2BFD*

38-06 61st Street, Woodside 77, N.Y.

Part II of a Two Part Story

As the teleprinter code calls for various combinations of "marking" and "spacing" of the five character selecting pulses, the first approach to a sending keyboard might close from one to five contacts, in addition to the universal contact. With this arrangement the failure of any one contact would cause a misprint, whereas with a single contact arrangement nothing would be printed. An early form of a "printing telegraph" eased this problem by permitting each of the 32 keys, through a single contact, to operate a relay with multiple contacts. The contact problem was still there but the relays were less apt to have trouble and were much easier to clean. The present-day teletype keyboards use notched metal code-bars to translate the code. This system could be used by amateurs with machining ability but it does represent a more difficult solution to the problem than the matrix system.

The rectifier matrix is an old idea and has been used in many computing machines. Neon bulbs may be employed for the same purpose. Considering that there are 80 selecting elements needed for the RTTY keyboard it is obvious that costs would run high if 1N34's or neon bulbs were used, not to mention the problems of mounting and the space involved.

The one rectifier that is usually available around any Ham shack is the small selenium rectifier used in AC/DC broadcast and TV sets. From each disc of such a rectifier many rectifying units can be made. It is quite possible to make up to 30 rectifier cells on a single 1" diameter selenium plate. Of course they will have a common anode and individual cathodes. One surprising discovery was that each segment could handle quite a bit more power than its proportional size would indicate. In one test a disc, removed from a 100-ma. selenium rectifier, was divided into 16 segments. For the same temperature rise permitted the entire disc at 100 ma., the single element could handle 40 ma.! A single segment of this disc was loaded to 60 ma. and left running continuously for two months with no resultant measurable deterioration to the disc. Selenium rectifiers are noted for the fact that they will handle almost any current if the temperature rise can be kept within limits. The power handling capacity of the small segments then would appear to be a result of the entire area of the plate being available for radiation of the generated heat.

Since this process of segmenting the selenium plates brings the cost per rectifier down to less than one cent per element it is a natural for the keyboard matrix. In normal typing, using a matrix rectifier of this type, there is never more than one segment of a disc used at one

* The biography of the author appeared with the first part of this story.

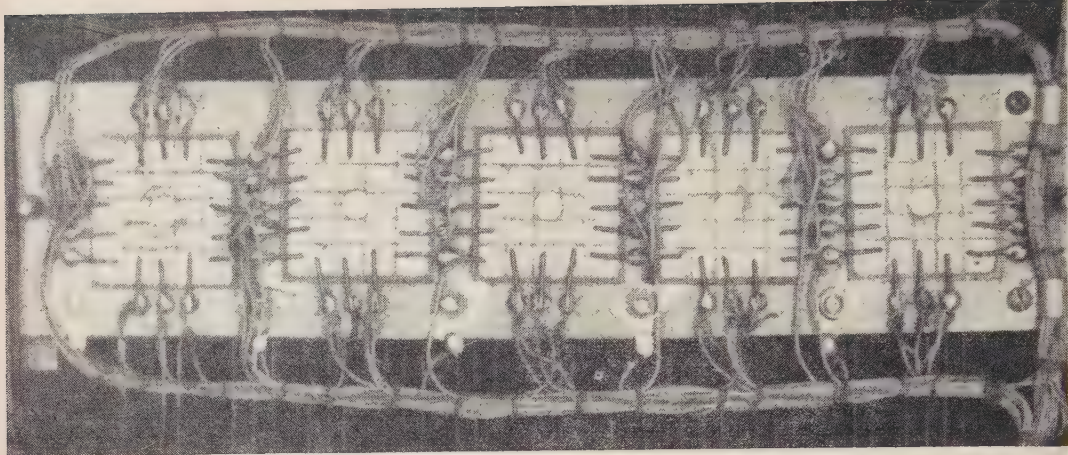


Fig. 1. Closeup of the matrix made of small selenium rectifier plates.

time. Current flows through the selected segments for not more than about twenty milliseconds during each 163 millisecond character. Theoretically, the 40-ma. segments should be able to handle about 400 ma. pulsed. Once built, the matrix should be permanent and trouble free.

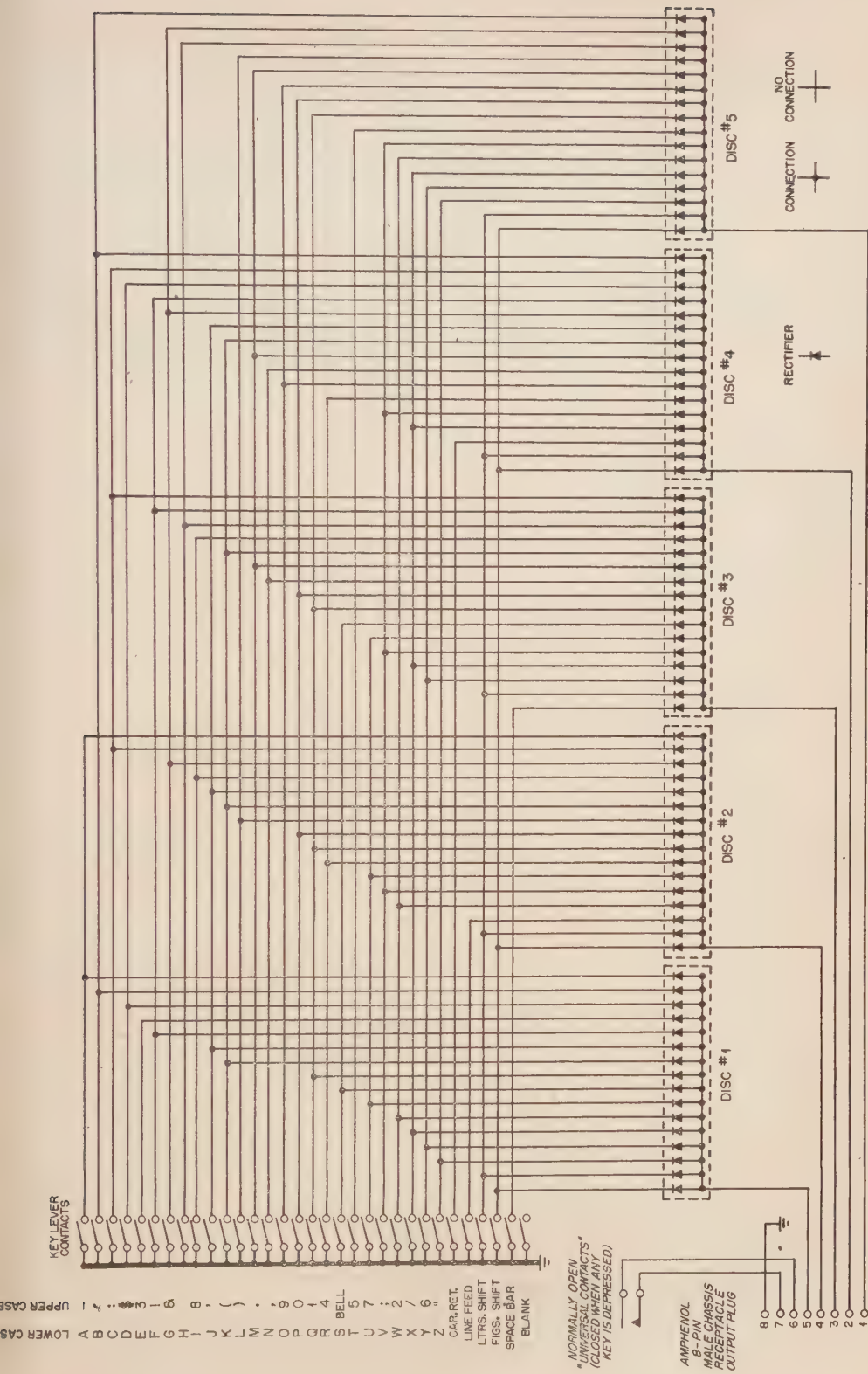
Fabricating the Matrix

The encoding matrix for the keyboard was constructed from a single six plate 250-ma. "Seletron" TV selenium rectifier. Although paint may be removed from the rectifier by dropping the plates in lacquer thinner, it is better to try to locate one not completely coated with paint. The hollow rivet which holds the assembly together can be removed by filing one end until the discs can be carefully slipped apart. Take special care of the silvery rectifier surface during these operations. The surface of each plate should be marked with four horizontal and four vertical pencil lines dividing the area into 25 squares approximately $\frac{1}{4}$ -inch on each side. Lay the plate on a flat surface and, using a machinist's scribe, or awl, and a steel rule laid along the lines, scribe heavy enough to go through the selenium coating into the backing metal (steel or aluminum) but not heavy enough to raise burrs in the backing metal. The scribe should be drawn from edge to edge in a single motion, starting and finishing outside the rectifying film. When all of the lines have been scribed you will have a plate containing 24 rectifier squares (the center hole makes one square unusable), each of which must be electrically insulated from its neighbors. An ohmmeter using a 1-ma. meter and a 3-volt battery will probably show from 50,000 ohms to 200,000 ohms in the non-conducting direction between each cell and the backing plate. In the conducting direction it may be from a few hundred ohms to around 2000 ohms. At the 12-volt potential level supplied to the matrix in use the forward resistance is very much under 100 ohms.

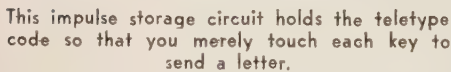
If two squares indicate that they are shorted together (probably by burrs) they may frequently be corrected by scribing again very carefully in the same groove. If you still have some trouble with shorts you can use the W2BFD "infallable" method of sending a brief pulse of 12 volts a.c. through the two rectifiers with NO LIMITING RESISTANCE in series. There will be a short crackle and a blue flash as the short disappears. This trick seems to work regardless of whether the short is from element-to-element or from element-to-backing-plate. A word of caution: *Do not* start the current flow by striking a wire against the segment as this will burn the coating. Establish the contact first and then momentarily switch on the current.

Five of the plates thus prepared are then laid on a piece of thin insulation face up with their centers about $1\frac{7}{8}$ " apart. The insulation strip was cut to $10\frac{1}{2}" \times 2\frac{1}{2}" \times \frac{1}{8}"$ so that it would just fit the width of the typewriter base underneath the center of the keylevers. Alongside each of the 16 outer rectifier elements (of the 24 available) of each plate a hole is drilled to fit a small screw ($4-40 \times \frac{3}{8}"$ long round-head cadmium-plated) which will support the contact finger to conduct the current to the external circuit. The contact is formed from a $\frac{1}{2}$ -inch long piece of spring-brass wire of .043" diameter (not critical) which is soldered into the slot in the screw-head. The wire should be bent at about 45° downward so that when the screw is installed in the insulation strip it will force the wire to make a good contact with the segment of the plate. The connecting wire for each contact should be soldered to the screw-head before mounting on the insulation so that the contact won't loosen. Sharp points should be removed from the brass wire contacts by the use of emery cloth.

A close look at Fig. 1 will show you that the five contacts between each of the sets of plates carries double-end contact fingers made from 1"



The inter-connections of the matrix look pretty complex but they are really quite straightforward and simple to connect when doing the job.



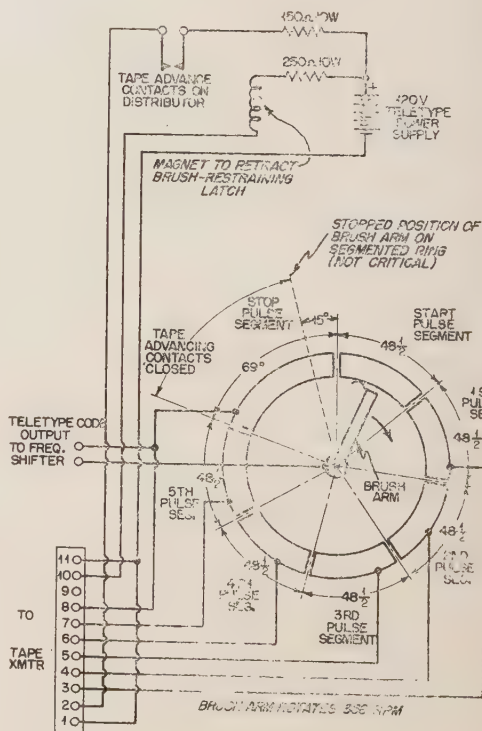
pasted to this cover. Indication should be made on it of the connections assigned to each character.

The simplest way to wire the matrix is to run separate wires from each of the segment contacts (65 wires in all to the keylever contact screws. This keeps congestion at the segment contacts at a minimum.

An 8-pin *Amphenol* male chassis connector should be mounted on the left rear lip of the keyboard casting. The connections to the backing plates of the matrices should go to *pins 1, 2, 3, 4* and *5*, respectively. *Pin 8* should be grounded and also connected to a grounding pigtail on the keylever pivots which are all soldered to a grounding wire to assure good contact. *Pins 6* and *7* connect to the universal contacts which may be mounted in any suitable fashion on the left sidewall of the keyboard. Both sides of the universal-contacts should be insulated from ground. Of course one more matrix plate could have been used in place of the universal-contact arrangement but this seemed a bit more complex.

Storage of Impulses

A few thousandths of a second after depressing a key, a coded output is available from the matrix. This output consists of "current" or "no current" according to the combination re-



Wiring diagram of a typical tape distributor such as those used with the "Junkeyboard." These units are fairly inexpensive and are in good supply.

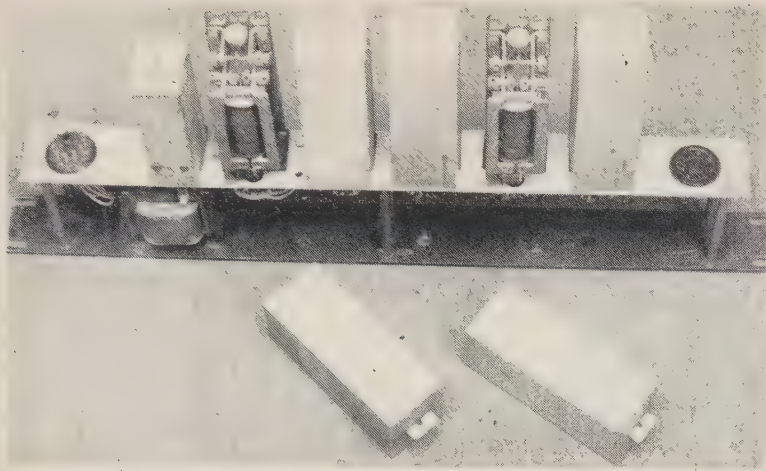


Fig. 2. Pulse holding relay rack with five inexpensive polar relays and one telephone type relay.

quired for that particular letter. The five-unit code permits a maximum of 64 teletype selections, 32 in lower case and 32 in upper case (two to the fifth power is 32). Transmission by wire or by radio requires that these five pulses, to which "start" and "stop" pulses have been added, follow one another and not occur all at one time. This means that some sort of storage method must be used. This can be done with condensers, relays or vacuum tubes, but the use of five relays seems to be the simplest and cheapest method. Plain telephone type relays may be used with additional locking windings or locking contacts. A simpler system is to use five of the inexpensive polarized relays now available to the amateurs for \$1.50.* These relays can be adjusted so that a pulse of current through the winding will position the armature against the *marking* or *spacing* contact (depending upon the direction of the current flow) and it will lay against this contact even though the current ceases until a pulse of current in the opposite direction moves it to the other contact. Polar relays are also known for their speed of action, making the choice even easier. This same relay assembly is actually needed for certain types of teletypewriter tape transmitters and need only be switched to the electronic keyboard when manual transmission is desired. The same relays will thus serve two functions.

As the matrices are, by nature, rectifying devices, there is no need for a DC supply. A common 12.6-volt filament transformer (Merit P-2959) furnishes the exciting current for the entire keyboard.

Keyboard Lockout

With no provision for "lockout," errors will occur in the transmitted signal if a second key

is depressed while the code from the previous letter is still being sent. As the matrix output current only moves the relays to their *marking* contacts, to be restored after the code has been transmitted to their spacing contacts, pressing a key, let us say, for "A" which requires *relays 1 and 2* to move to "mark," followed by "N" which calls for *relays 3 and 4*, the letter actually transmitted would be "K" which calls for *marking on relays 1, 2, 3 and 4* (provided the second key was pressed soon enough). Lockout is very easily accomplished by removing the matrix voltage as soon as the relays have been positioned by the first key and not restored until the full character has been transmitted. This is accomplished by means of the telephone-type (B-199) relay (Ry-6) which is arranged to operate as soon as the distributor begins its cycle. The contacts of this relay interrupt the 12-volt transformer supply. The polar relays will operate in less than one-thousandth of a second and have about twenty times that interval to position themselves.

Storage Relay Restoration

The storage relays are moved to a marking condition by the keyboard and some method of returning the relays to a spacing condition at the end of the cycle must be built in. Restoration is obtained by passing a d-c pulse from the distributor (at the end of its cycle) through an audio transformer primary. The transformer differentiates the d-c square-wave passing through the primary and provides two pulses of opposite polarity from the secondary. One pulse, coinciding with the leading edge of the square-wave, is passed through another divided plate rectifier containing five segments and thence to the polar relay coils. The polarity of the transformer must be correct or else it will be the trailing edge of the square-wave which

* Available from the V.H.F. Teletype Society c/o of the author.

[Continued on page 56]

DX



and Overseas News

gathered and reported by

R. C. "DICK" SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands

CORSICA, F8FW/FC: Pierre, HB9LA, and Etienne, HE9RDX (DX Editor "OLD MAN"), put this relatively rare spot on the air between July 31 and August 11. A very creditable job was done in the face of frequent breakdowns, low voltage and voltage failures. A total of 2411 contacts were made in 70 countries on all bands from 3.5 21 Mc. F8FW/FC went on the air at 0044 GMT, 7 Mc., July 31. First QSO's were with SM7ANB, VE1EK, SM7CAB, SM5WM and G8DR. At this point the first of a series of breakdowns occurred and after two hours of troubleshooting operation was resumed with W2TWC, W2FXN, K2EQD, W3SWV and W3AXT being next in line. 103 contacts were made on 3.5, 522 on 7, 1654 on 14 and 132 on 21 Mc. First W's on each band were as follows: 3.5—K2BZT, 7—W2TWC, 14—W3JNN. "First's" in each W district were: W1ZL, W2TWC, W3SWV, W4CDC, W5GND, W6VUP, W7BMK, W8PQQ, W9TKV and W0GKL. The transmitter at F8FW/FC, thoroughly shaken up by the rough ride during the 100 mile trip from Ajaccio to Bonifacio, ran 200 watts to an 813 modulated by PP 807's. The receiver was a 22-tube, double-conversion, super-het. The antenna was a 360-foot longwire 100 feet high. The valuable assistance and kind hospitality of Raoul, F9QV/FC, and his XYL did much to make this expedition a success. F9QV/FC is now on the air with a new rig running a pair of 807's but his radio maintenance work obliges him to travel around the island much of the time thus limiting his operating time. The plans of F8FW/FC to spend the last four days in Monaco as 3A2LA were cancelled in view of transportation difficulties. The 3A2 trip may take place next year. *(The island of Corsica, being a "Department" of France, has no separate prefix altho the suffix /FC is generally used by stations there. Efforts are presently being made to make "FC" official for this spot.)*

TOKELAU, ZM7AL: (Via W6QHS) Ernie, ZM6AL, advised that he had visited this spot for a week to ten day stay, September 14 to 24, and planned to be active on 7020 and 7081 kc. with a 10-watt transmitter which is presently in operation on that island. We hope that this operation has gladdened the hearts of many who missed out during the somewhat erratic operations of VR2BZ/ZM7.

ALBANIA, ZAIKAD: *This station was heard on Sept. 15, 2000/2230 GMT, 14080 kc., giving his name as "Nako" and QTH as Tirana (Box 69). QSO's of thirty minutes duration each, were noted with W3ECR, W1CLX and W3OCU. (In the past many phony calls have emanated from this QTH. For this reason we mention ZAIKAD with considerable "crossing-of-fingers." However . . . could be!!)*

Last Minute Items

Operation from SV0WK/9, CRETE, September 5 to 8, manned by Fred, SV0WK/K6AUU (phone) and Ted, SV0WL/W6ZID (CW) resulted in 471 contacts in 58 countries. QSL's should now be out. Further details of this expedition will appear in the December issue. . . . On October 4, H1sWA, 14096, CW, was on the air for a few hours giving many a much needed HI contact. The operator was Bill, W4QV, and QSL's should go via W4QV. A few contacts were noted as follows: W3RNQ, W4BQY, W3LMM, W3YNO, W5BPH, W9HEP and W0QGL. . . . W4LZF reports a contact with ZD3BFC, 7038, 0720 GMT, October 2. This seems to confirm Bill's promise to get on CW when his "bug" arrived from G-land. Also, contrary to a report in the October CQ, we understand that ZD3BFC will be active for two years! HK0AI, San Andres, continues activity on 7008 around 0100 GMT. . . . FG7XA was speared by W4QCW on 7010, 0315 GMT. . . . W1BLF heard that activity was scheduled by ZM7AR, 14060, during the weekend of October 9. . . . Openings reminiscent of "ye good old days" have been occurring with W3FMC reporting FR7ZA QSO on 7010 at 0250 GMT and DU7SV and HS1D pouring through on 14 Mc. around 1300 GMT. (We have heard of no lifting of the ban on HS1D as yet). . . . AC3PT has been reported on 14061 at 1230 GMT while those needing French Guiana might tune for FY7YE, 14061, and FY7YC, 14018, who seem to be on most mornings around 1100 GMT.

VQ6LQ is reported to be a new one on the air by VQ2AB who contacted him on October 1, 14070, 1540 GMT. It appears that he will be around for some time and is ex-ZD1LQ. Cards should go via P.O. Box 11, Hargeisa, Br. Somaliland. . . . W4UIV may be heard from West Pakistan (or Turkey) in the very near future. . . . Notes via OK1MB state that the University station LH2P, Spitzbergen, and LB9UE, Bear Island, will both be active in the near future. . . . ZC5VR will be heard from Sarawak with a 3-element beam and Panther, 120-watt, rig. He will be heard, same as VS4HK (ex-ST2HK), around 1600 GMT. . . . QSL's for ZC5SF, 14020, should go via Box 232, Sandakan, Br. North Borneo. . . . ZC7BB, Jordan, should be back in G-land as this is read. . . . ZD6BX and ZD2DCP may be heard on 3503 from 0300 to 0600 GMT on Saturdays. . . . F9RS reports that FF8AN has flown to Douala, French Camerons, for a tour of duty with Civil Aviation there and should soon be heard as FE8AC or FE8AN. . . . ZL1MP may soon be heard as VP7NI on Eluthera Island in the Bahamas. . . . There are possibilities of a trip to NAVASSA by KG4AP around Xmas. . . . EL2X vacations in Europe from mid-October to mid-November.

DX Notes

W8MPW has received a QSL from LZ1DX/ZA. This expedition to Albania (some thought it was of the ST2UU variety) took place August 30 to September 3, 1951 and all contacts were on 14038 kc. The gear consisted of a 5-watt transmitter and 2-tube receiver. Dimiter seeks QSL's from KP4QZ, KP4LK, TI2TG and CE3AG for LZ1DX contacts. They should go via G2MI. . . FW8AB, Wallis Island, has been appearing off and on. August 20 contacts were noted with W6SR, W6TI and W6TT on 14075 (5 kc. drift) at 0500 GMT. We hear that Wallis will be reconsidered as a separate country. Hitherto it has been counted as a regular FK8. FW8AB skeds FK8AO and FK8AC on Saturday at 0400 GMT, 14074 (sometimes 14040). . . From VK3CX we hear that VR3A has had 6000 QSL's printed but they will not reach him until December. . . W8AJW suggests Simons-town, Union of South Africa, as a separate one, much in the KG4 style, as it is Crown property. John also suggests investigation of Walvis Bay, Southwest Africa which was occupied by England prior to 1918. . . EL2X advises that a batch of ZD3BFC QSL's have already gone forward. G2MI says that ZD3BFC will be in Gambia for two years. (Watch 14110 1600/1800 GMT A3. No CW noted as yet). ON4AU reports ZD9AB on 14100, 0800 GMT, 350 watts. . . From W1VXA we hear that DL3SS is the Iranian ambassador to Germany and it is possible that he may be heard from his home station, EP3SS, during November. EP3SS runs 50 watts to an 807 on 14040 kc. (Contacts with Iranian Hams are presently banned by FCC.)

W3BHV reports hearing AC4NC on 14055 and 14010, 1100 GMT, weekends. . . VK4YP says that Doug, ZK1BG, will show from ZM7 some time soon. . . G6ZO nabbed VS4HK, Sarawak, at 1457 GMT, August 28, 14100. Jim called him 10 kc. off frequency. . . F8PQ reports FB8BK (Tromelin Island), T6, 1445 GMT, 14052. . . Rog, W4PNK, reports contact with TT2FD (Sounds like an antenna), Tannu Tuva, on 14050, at 1415 GMT. TT2FD said that AC4NC, Chak, has arrived there safely?? QSL's go via VU2JP. . . G3AAM worked MP4QAJ who was airborne, returning to OD5AF. . . Mirko, YUIAD, reports MP4QAI, Qatar, on phone. He says QSL via MP4QP. MP4QAI speaks French but can also QSO in English. . . Jim, YN1AA, advises that the ban



Neat and very potent is the set up of the well known I1BNU/TRIESTE. (Photo courtesy VE3IG)

on YN Hams, since April 4, has now been lifted. YN1AA came back on the air September 11. . . Via F9RS we hear that Jules, VP9BM (ex-TA3AA, SV6AA, SV7AA), has applied for a license to operate from the French half of the West Indian island of St. Martin. If this is expedited it is possible that Jules may be there for the DX contest. If not, the trip may go forward in May or June of next year. W6SAI and W2BBK, who both hold FP8 licenses, are also eyeing this spot and we suggest all hands "get-together" on this project. In this area the French island of St. Earthelmy and the French half of St. Martin comes under the administration of Guadeloupe, FG7, and will probably not be considered separate. However, FG7 is sufficiently "rare" to warrant putting any one of these spots on the air. The Dutch group of islands consisting of Saba, St. Eustatius and the Dutch half of St. Martin might seem a more logical choice for "separate country" status as they are

The radio expedition to San Andres Island, last May, when the prefix HKØ was put on the air for the first time, created quite a furor in the DX ranks. Some 75 HK Hams went along on the transport "Almirante Padilla." Top left photo shows the group engaged in /MM operation; top right, the "shack" position on the "Padilla." Lower left: HKØDP (rear) and HKØEH in operating position on San Andres; lower right—HKØ's, as labeled. Photos courtesy HK4DP/HKØDP.



Right, needing no introduction to the DX fraternity are Eva and Alex of CN8MM French Morocco. Upper photo shows the very effective stacked beams.

Takeo Kuwahara, JA1CR, Tokyo, Japan runs 120 watts to a pair of 807's. Receivers are a Super-Pro and BC-312-N/HF 10-20. A GP antenna is used on 3.5 and modified dipoles for 7, 14, 21 and 28 Mcs. Takeo is now up to 108 countries and 34 zones. He seeks zones 9, 10, 16, 18, 19 and 35.



located over 500 miles from the administering government in Curacao.

Word now comes from PY2CK who says PY0 in November... perhaps!... Augmenting the somewhat stilted activity from VP4, Trinidad, will be VP4TP. He will be on 7 and 14-Mc. CW only and was formerly active from G3CBF, MP4KA1, ZC6BF and 4X4BF. . . . Via Short Wave Magazine we hear that VQ8AL and VQ8AR plan a 10 to 15-day trip to Rodriguez Island in January. This QTH is some 330 miles East of Mauritius and "we quote" should count as a new one. . . . Jottings from the West Gulf Bulletin as follow: HB1MX/HE was very active around 14030 passing out contest type QSL's freely. Clean but QRS. He left August 15. . . . EL2X needs Idaho to complete WAS. . . . W5YLL heard VR2BZ/VR5 on September 5 working W6's, 14153, A3. . . . W5EFC nabbed AC3PT, 14044. . . . VK1AC (Macquarie) QSL's will be out early next year. . . . CN8MM says ZA1KAC is legit and QSL's. . . . YJ1AA is active but questionable. . . . VP8AZ works on 14050 and will QSY to 14150 for A3 contacts. . . . VK4NC opines that VK4IC should count as a new one and will soon have a VK9 call. . . . VQ4NZK will definitely go to VQ9 late this year. . . . W8BKP can furnish QTH of YA1AA (phone 14198) only to those who have worked him. . . . (Via G3FXB) VQ8CB skeds FR7ZA 14040/7058, 1315 GMT, Sundays.

In a farewell dinner given to Tom Gabbert, TI2TG, the following members of the Radio Club of Costa Rica, and visitors, may be seen (Standing L to R) TI2JA, TI2RJ, TI2MS, HK2GO, TI2RL, TI2BX, LU4DZ1, TI2AJ, TISWLC (Jr. op), TI2OFR, TI2AAL, TI2RU, TI2LJ, TI2RKL, TI2PZ (Sitting L to R) TI2WFP, TI2SJ, TI2TF, TI2TG, TI2DLM, TI2JRC and TI2WLC. TI2TG was given a plaque which read "To Tom Gabbert with the recognition and affection of his friends and amateur radio colleagues for his extraordinary cooperation" (Sig) Radio Club of Costa Rica, August 1954. TI2TG arrived at Wilmington, Calif. on August 22 and was met by W6MBA, W6MUR and W6YY. We hope to hear him soon as a W6.



DX-plaits

Ken, W0YXO, comes up to date with 9 additions dating from FL8MY days, and now occupies the No. 2 position on WAZ with 252. . . . Andy, W6ENV, ups to 251 with VR2BZ/ZM7. . . . Marv, W6VFR, also hits 251 with the addition of F08AJ. His phone total reaches 184 with F08AJ and 4S7YL. . . . Don, W6AM, now rests on 248 thanks to VR2BZ/ZM7 and SV0WK/9 (Crete). . . . Jim, G6ZO, keeps pace with Don by adding VS4HK for 248 while Frank, W6MEK, adds ten, such as OD5LX, FB8XX and VS4RO to reach 247. . . . Al, W8PQQ, goes to 246 with SV0WK/9 and MP1QAH while discarding PX1AR. . . . W5YG also reaches 246 with VR2BZ/ZM7 and HK0AI while Jim, W8JIN, comes up to date with 8 for 246. . . . Howy, W2AGW, smarting under the ST2UU loss, recoups with HK0CV and SV0WK/9 for 244. . . . VR2BZ/ZM7 pushed W6MX to 243 while Ed, W6DZZ

[Continued on page 65]

A COMPLETE AMATEUR STATION

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Harvey-WELLS BANDMASTERS

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Factory built & tested
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The midget with a
MIGHTY PUNCH

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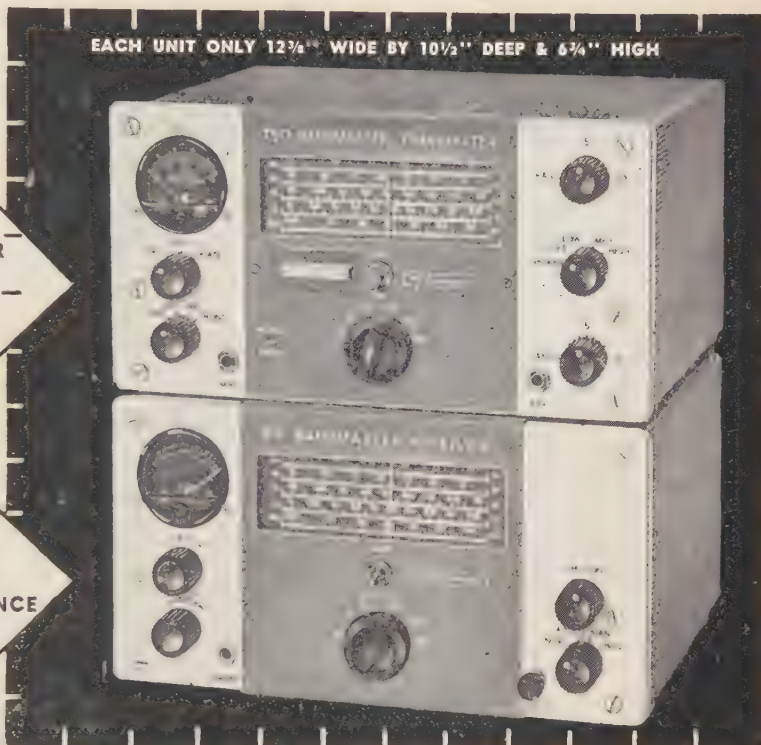
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PACKED WITH PERFORMANCE

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the YL's Frequency



Monitored by

Louisa B. Sando, WOSCF

Towaco, Colorado

YLRL's 15th Anniversary

Just fifteen years ago the *Young Ladies' Radio League* came into existence. Small in scope, but ambitious in aims, it was destined to become a major force in amateur radio. It all came about this way:

The May, 1939 issue of *QST* contained an ad for the late W1CBD's book "Two Hundred Meters and Down." One statement was, "Goodness knows—and you won't tell—how many of you YL key-twitchers there are . . ."

W7FWB, Ethel Smith (now W3MSU), wrote to the ARRL: "Nobody seems to know, but I think we would tell. I should like to have you publish this letter or some kind of a request to have the YLs make themselves known . . . So how about it YLs? Perhaps we should band ourselves together in a YLRL or something to that effect and make these women-ignoring authors sit up and take notice." Ethel's letter was published in *QST* a couple of months later. Not only did it result in starting our organization, but named it as well.

Twelve girls answered that letter. Enid Carter, W9NBX (now Enid Aldwell, W6UXF), became the spark-plug of the group. From the girls she compiled a list of names and addresses of other YLs and drew up a tentative constitution. The proposed YLRL *Constitution and By-Laws*, dated Sept., 1939 lists these YLs as charter members: W1GQT, W5HYF, W6RGX, W7FWB (now W3MSU) W7GXI, W8SBB, W8TAY (now W4JCR), W9CHD (now W6NAZ), W9NBX (now W6UXF), W9NLW, W9UA (now W0UA), W9WWP (now W6WSV), and VE2HI. A succeeding copy of the *Constitution* bears the statement, "Adopted October, 1939."



Enid selected these officers to start the YLs on their way: W7FWB, Ethel, became the first president; W9WWP, Carol Keating was appointed vice president and activities manager; W9NBX, Enid, took on the duties of secretary-treasurer, and soon W8TAY, Anita Bien, became publicity chairman. Enid also set dues—25c a year!

Enid then began publishing a monthly bulletin. The first issue, Vol. 1 No. 1, was dated Nov., 1939 and entitled "YL News." A single mimeographed sheet, it contained a plea for members and requested suggestions so that the bulletin might be named.

Response was quick and enthusiastic. Vol. 1, No. (Dec. '39) bore the name *YL Harmonics*, which Enid chose from among twenty suggestions she received, ranging from "Hamettes" and "QTT" (Quiet To Tell) to "Spurious Radiations" (suggested by an OM!). Up to three pages, it announced a December "Get Acquainted" QSO Party on 40 and 80 CW, inaugurated "Chatter" (district reports), listed district chairmen, and contained this list of paid-up members: W7FWB, 9NBX, 9CHD, 9NLW, 9DBL, 1FOF, 9WWP, 2KUG, 9ILH, 6EK, 8TAY, 3TAY, 3FXZ, 6RGX, 1KEP, 1GQT, 2KBG, 2IXY, 9OWQ, 7EIU, 8SIF, 9UA, 2FKA, 8TPZ, VE2HI.

In the February, 1940 issue of *YL Harmonics* (Vol. 1 No. 4) Enid warns "Beware the OM who passes



The first local chapter of YLRL was founded in Cleveland by W8TAY in June, 1940. At its second meeting W8PWY took this photo of the YLs. L. to r. on couch: W8PZA, Mildred; W8CKH, Gertrude; W8ODI, Ruth, and W8TAY, Nita. On floor: W8SBB, Mary, and W8UCY, Carol. W8TLZ, Ruth, was also a member at this time. Photo courtesy W4JCR (ex-W8TAY).

Left—W6UXF, Enid Aldwell, was W9NBX, Enid Carter, at Bowbells, N.D., when she spark-plugged YLRL and took on duties of secretary and editor. She is wearing an authentic Bavarian costume, an example of her latest hobby.

himself off as a YL. WIOR has been taken off our membership list since it was discovered that the only feminine thing about him was his desire to be a member of the YLRL!" *W9EXM* reported organizing the *Keno YL Club* in Kenosha, Wis., for all women interested in becoming radio operators.

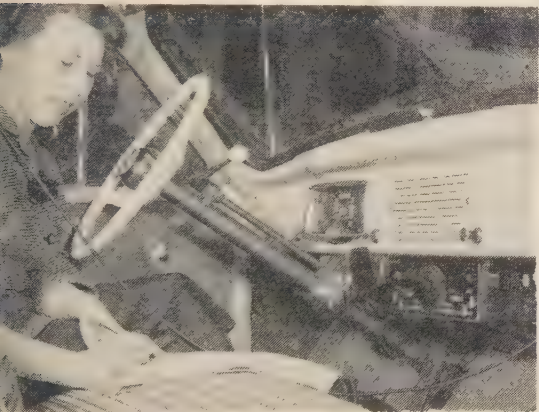
The April, 1940 issue of *YL Harmonics* was up to six pages, listed YLRL nets on 160 and 20 phone, and 80 and 40 CW. First members in England and Alaska were welcomed. By this time the Ham world was taking official recognition of the youngster in its midst, not yet a year old. The May, 1940 issue of *QST* carried the article "The YL's Unite!" compiled by W8TAY, Nita (now W4JCR). At this time Nita also conducted "YL Chatter" in *Radio News*.

Vol. 1 Nr. 7 set forth the policy of *YL Harmonics* and YLRL to use the term "YL" for all licensed amateur operators of the feminine sex, and the June issue announced YLRL's affiliation with ARRL. Also in June, 1940 the YLs of Cleveland, Ohio, united to form the first official local YLRL chapter.

1st Anniversary

November, 1940 brought *YL Harmonics* to its first anniversary, and that issue boasted 15 pages and cover. It announced the winner of the slogan contest as W8TAY, Nita, who submitted the slogan "QRV—I am ready." The 1st Anniversary Party contest highlights were given. W1FTJ, Dot, won the contest and received the *Corcoran Cup* donated by W8TPZ. YLRL nets were now in operation on 160, 80, 40, 20 and 10.

YLRL was really on its way! To further the YLs



pages and cover. One whole page contained a list of job opportunities for YLs in the CAA, Navy, Signal Corps, at MIT, in the WAAC and WAVES. Membership was now listed as over 300.

At war's end YLRL was still a closely knit organization, able and ready to continue with *YL Harmonics*, to reactivate nets and contests. In 1949 W6NAZ, Lenore, and W6YRL, Sandy, compiled data on all the members and in May of that year the first YLRL Callbook was published, proceeds of which helped to swell the club's treasury.

10th Anniversary

1949 also was YLRL's 10th anniversary. The Oct.-Nov. issue of *YL Harmonics*, with W30QF, Barbie, as editor, contained an FB account of YLRL's beginnings and history to date. 31 pages in size, it listed member-

[Continued on page 60]



W4JCR, Anita Bien, was W8TAY in Cleveland when she accepted the post of YLRL's first publicity chairman.

Left—W3MSU, Ethel Smith, was W7FWB in Washington State when she started YLRL on its way and became the first president.

W6WSV, Carol Witte, was W9WWP, Carol Keating, in Chicago when she was appointed YLRL's first vice president and activities manager. She is pictured here while taking WAVE training in N.Y.C.

enthusiasm a YLRL song was written with words by W8UDA, Dot. And it was about this time that our "33" signature was originated by W3KYR, C'ara (now W2RUF). Its original meaning, as published in *YL Harmonics*, was "Love Sealed With Friendship between one YL and another YL." YLRL stationary and pins were also now available.

YLRL activities progressed rapidly in 1941. W.NBX, Enid, became president; W8TPZ, Marie, vice president; W9DBD, Leta, secretary and editor, and W8TAY, Nita, continued as P/C. Membership grew to 250 and many YLs were engaged in Civil Defense work. The October, 1941 issue of *QST* carried W8TAY's article "YLRL QRV!" Later Nita received a letter from Eleanor Roosevelt who was assistant director in the Office of Civilian Defense, applauding YLRL members on their enthusiasm for their work as described in the article and stating it: "will prove of inestimable value should the need for active defense arise."

Then came Pearl Harbor and "curtains" to Ham radio for the duration! The YLs took their rightful places as radio operators, instructors, in industry, and in the women's auxiliaries of the armed forces.

W8TAY, Nita, became YLRL president and editor in 1942, and it was at her insistence that *YL Harmonics* was kept going to hold the girls together. Serving with her were W8UDA, Dot, vice president; W1FTJ, Dot, secretary-treasurer; W7HDS, Lizette, P/C.

The third anniversary issue in 1942 contained 13



EASTERN USA TO:

	ALL TIMES IN E S T		
	15 Meters	20 Meters	40 Meters
Western Europe & Central Europe	0800-1330 (3)	0600-1400 (3-4) 1400-1600 (2)	1500-1700 (2-3) 1700-2000 (3-4) 2000-0400 (2)
Southern Europe & North Africa	0730-1400 (3-4)	0600-1430 (3-4) 1430-1630 (2-3)	1530-1700 (2-3) 1700-2000 (3-4) 2000-0230 (3)
Near & Middle East	0730-1130 (2)	0700-1300 (2-3)	1730-2230 (2)
Central & South Africa	1000-1400 (1)* 0730-1400 (2) 1400-1600 (2-3)	0600-1300 (1) 1300-1500 (1-2) 1500-1730 (2-3)	1730-0100 (2-3) 1900-2300 (1-2)
South America	1000-1500 (2-3)* 0800-1500 (3) 1500-1700 (4)	0630-1530 (2-3) 1530-1730 (4) 1730-1900 (2) 0000-0200 (2)	1800-0500 (3-4) 0500-0730 (2-3)
South East Asia	Nil	0700-0900 (1) 1500-1800 (0-1)	0300-0700 (0-1)
Australasia	0730-1200 (1) 1600-1830 (1)	0630-0900 (2) 1200-1800 (0-1) 1800-2000 (1)	0100-0800 (2-3) 0300-0700 (2)
Guam & Pacific	1530-1800 (1)	0630-1000 (2) 1530-1830 (1) 1830-1930 (1-2)	0000-0700 (2-3) 0100-0530 (1-2)
Japan & Far East	Nil	0630-0900 (1-2) 1500-1700 (1)	0200-0700 (1) 0200-0600 (0-1)

CENTRAL USA TO:

	ALL TIMES IN C S T		
	15 Meters	20 Meters	40 Meters
Western & Central Europe	0800-1100 (1-2)	0700-1300 (3) 1300-1430 (1-2)	1630-1930 (3) 1930-0330 (1-2)
Southern Europe & North Africa	0700-1300 (3)	0600-1330 (3-4) 1330-1500 (2)	1630-2000 (3-4) 2000-0100 (2)
Central & South Africa	1000-1330 (1)* 0700-1330 (2) 1330-1500 (2-3)	0530-1230 (1) 1230-1430 (1-2) 1430-1700 (2-3)	1700-0000 (3)
Central America & Northern South America	1100-1400 (2)* 0730-1400 (3-4) 1400-1600 (4-5)	0800-0900 (3-4) 0900-1500 (2-3) 1500-1800 (4) 0100-0230 (1-2)	1800-0600 (4) 1900-0430 (3-4)
South America	0900-1500 (2)* 0700-1430 (2-3) 1430-1600 (3-4)	0600-1500 (2-3) 1500-1800 (3-4) 1800-2000 (1-2) 2300-0200 (1-2)	1800-0530 (3-4) 1900-0590 (2-3)
Japan & Far East	1500-1730 (1)	0700-0900 (1) 1500-1700 (1) 1700-1830 (2)	0100-0800 (1-2) 0200-0600 (1)
South East Asia	1500-1830 (0-1)	0700-0800 (0-1)	Nil

CENTRAL USA TO:

	ALL TIMES IN C S T		
	15 Meters	20 Meters	40 Meters
Hawaii	1300-1600 (2-2)	1000-1130 (2-3) 1130-1800 (1-2) 1800-2000 (2-3)	2100-0300 (3-4) 0300-0800 (2)
Australasia	1700-1900 (0-1)* 0900-1100 (1) 1400-1900 (2)	0700-1130 (2) 1130-1730 (0-1) 1730-1930 (1)	0200-0800 (3) 0300-0700 (2)
WESTERN USA TO:			
Europe & North Africa	0730-1000 (0-1)	0700-1300 (1)	1600-0000 (1-2) 1800-2300 (1)
Central & South Africa	1100-1400 (1)* 0900-1300 (1-2) 1300-1500 (2)	0600-0900 (1-2) 0900-1500 (0-1) 1500-1700 (1-2)	1700-2130 (2-3) 2130-0000 (1) 1800-2130 (1-2)
South America	0900-1430 (2)* 0700-1300 (3) 1300-1530 (4)	0600-1400 (2-3) 1400-1700 (4) 1700-2000 (1-2) 2300-0230 (1-2)	1700-0330 (3-4) 1800-0230 (2-3)
Guam & Mariana Islands	1330-1830 (1-2)* 1200-1630 (2-3) 1630-1800 (3)	0700-0900 (1) 1200-1700 (1) 1700-2000 (2-3)	0100-0700 (2)
Australasia	1400-1800 (1-2)* 1100-1900 (2-3)	0900-1200 (2-3) 1200-1700 (1) 1700-2000 (2-3)	2300-0700 (3) 0000-0600 (2-3)
Japan & Far East	1400-1800 (0-1)* 1300-1830 (2-3) 1630-1830 (3-4)	1200-1600 (2-3) 1600-2030 (3-4)	2200-0730 (3-4) 2300-0600 (2-3)
Philippine Islands & East Indies	1400-1800 (2-3)	0900-1100 (1-2) 1300-1430 (1-2) 1730-2000 (1-2)	0200-0700 (2) 0300-0500 (1)
Malaya & South East Asia	1500-1800 (1-2)	0900-1100 (1-2) 1300-1930 (1-2)	0300-0700 (1-2) 0400-0600 (0-1)
Hong Kong, Macao & Formosa	1500-1730 (2-3)	0700-0900 (1) 1400-1700 (1-2) 1700-2000 (2-3)	0100-0630 (2-3) 0200-0600 (1-2)

Symbols For Expected Percentage of Days of Month Path Open:
(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more
* Indicates time of possible ten-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 and Sacramento. These forecasts are, for the most part, based upon basic ionospheric data published by the CRPL of the National Bureau of Standards, and are valid until December 15th.



Leo E. Meyerson
W0GFQ

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Vacuum tubes make radio as we know it today possible; therefore every amateur should know something of their development and how they work.

The First Vacuum Tube

The incandescent electric was the forerunner of the first vacuum tube. The English scientist, Fleming, introduced a metal plate inside the evacuated bulb close to the filament. He then connected a meter and a battery in series between the filament and the plate (also called the anode) as shown in *Fig. 1*.

With this circuit, Fleming discovered a number of interesting things. With the battery polarity as shown, an electric current flowed through the circuit, which included the vacuum inside the bulb, normally an excellent insulator. He could control the amount of current by varying either the plate battery voltage or the filament temperature (voltage). Furthermore, reversing the plate battery connections cut off the current flow, no matter how high the voltage or how hot the filament. Finally, substituting an alternating current source for the battery produced a pulsating direct current flow through the tube during the half cycles when the plate was positive, with respect to the filament.

Fleming's experiments proved that the heated filament was emitting electrons, which are minute charges of negative electricity. Normally, these electrons hovered in an invisible cloud around the filament to form what is known as a *space charge*. The positive voltage on the plate overcomes this charge and attracts the electrons to it (*unlike charges attract; like ones repel*), thereby causing a current to flow from the cathode to the plate.

No current flowed in the opposite direction when the plate battery polarity was reversed, because the cold plate did not emit electrons to be drawn to the cathode.

Such a two-element tube is now called a *diode*, from the Greek *di*, meaning *two*, and *-ode* for *way* or *path*. Before discussing its uses and later tube de-

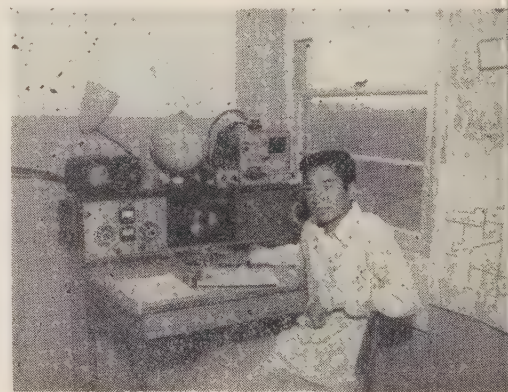
velopments, we will investigate the source of the electrons in a tube. Its general name is the *cathode*.

The Cathode

Although all matter contains tremendous quantities of electrons, knocking them free of most substances is like chipping granite with a toy hammer. The only really practical method of obtaining free electrons in the quantities required in a vacuum tube is the original method: "boiling" them out by heating a metallic filament (passing an electric current through it). This process is known as *thermionic emission*. When the heating and emitting functions are combined in one element, we have the *filament-cathode*.

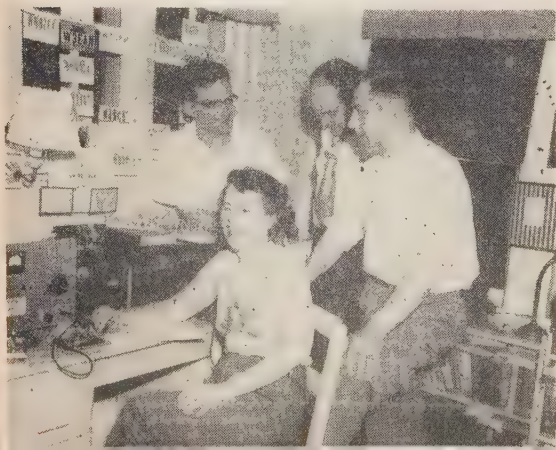
All early tubes used pure tungsten filament-cathodes, because it was the only material then known

* The difference between a **filament** and a **cathode** is a matter of definition. The word **filament** defines a shape—long and thin or thread-like, while the word **cathode** defines a function. Therefore, not all filaments are cathodes, nor do cathodes have to be in the shape of a filament.



Left, the husband and wife station of Bill, W3WRC (right) and Louise, W3WRE, Moreau, Johnstown, Pa. Standing beside Bill is his brother Ken, W9KRJ, of Gary, Ind., whom Louise and Bill call "Ham radio teacher extraordinary." To Ken's left is Bill's brother-in-law, "Buzz," W3WET, Glenolden, Pa. These calls are familiar to regular readers of the Novice Shack through Louise's reports on her sometimes-frustrating experiences as a Novice. As of early September, she, Bill, and "Buzz" shed the "N's" from their calls.

Clarence Kado, K6CJQ, Gardene, Calif., worked 44 states and seven countries with ten watts on seven Mc. in four months. Then, raising his power to seventy watts, he added another five countries. His antenna is a "drooping ground plane" vertical, fifty feet high.



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98 SX 711. Net... \$119.95



Hallicrafters SX-88. Dual conversion; 535 kc to 33.3 mc in 6 ranges. 2 RF stages, 50 kc second IF, crystal-controlled 2nd conv. osc.

98 SX 715. Net... \$595.00

98 SX 716. 10" speaker. Net.....\$19.95

Hammarlund HQ-140-X. 540—31 mc in 6 ranges. Crystal filter, ANL, 6 sel. positions, elect. bandsread, etc.

98 SX 766. Net... \$264.50

97 SX 757. 8" speaker. Net.....\$14.50



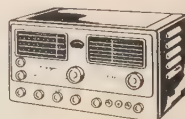
National NC-98. 550 kc—40 mc coverage. Crystal filter, S-meter, separate HF osc.

98 SX 732. Net... \$149.95

NC-98SW. As above, but with bandsread for 17, 19, 25, 31, 41 meter SW BC bands.

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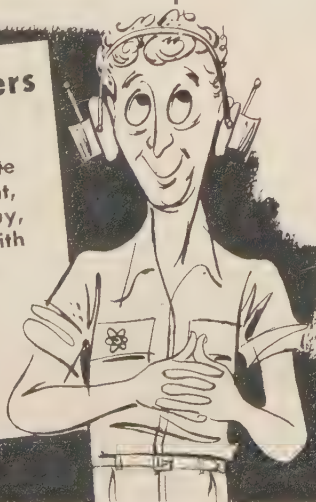
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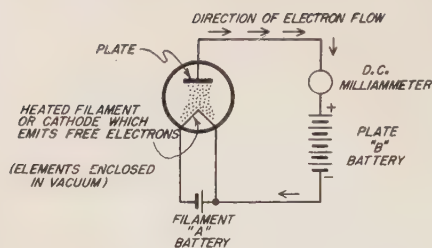
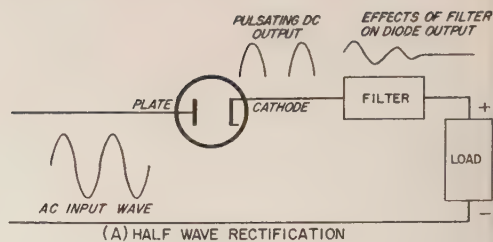


Fig. 1. Circuit to demonstrate properties of the diode, the first vacuum tube. Details in text.

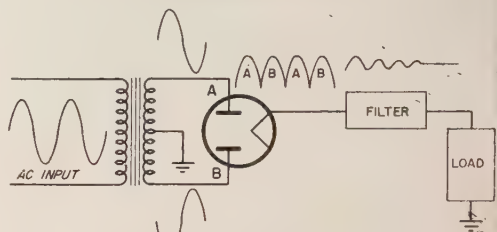
that could be heated enough to release electrons in quantity and still have a reasonably long life. Later, it was discovered that adding a small amount of thorium to the tungsten greatly reduced the temperature required to emit electrons. Next, it was discovered that certain rare-earth oxides exhibited still higher thermionic efficiencies.

In use these oxides are painted on the filament, usually a nickel alloy in this application. Also, because the temperature required is so reduced, it is practical to apply the oxide to an insulated metal sleeve and to pass the heating current through the filament inside of it. This arrangement produces an indirectly-heated cathode, and the filament is then usually called the heater.

The indirectly-heated cathode came into general use when power to heat the filaments was obtained



(A) HALF WAVE RECTIFICATION



(B) FULL WAVE RECTIFICATION

Fig. 2. Fundamental power-supply circuits using diodes as rectifiers. In (B), two diodes are combined in one envelope to form a full-wave rectifier. In high-voltage power supplies, separate $\frac{1}{2}$ -wave rectifiers are often employed. Part (A) is also used in the text to illustrate the mechanics of radio signal detection.

A few comparisons will give an approximate idea of the thermionic efficiencies of the various cathode materials. The *UV201*, a very early tube, required five volts at one ampere to heat its tungsten filament. Its successor, the *201A*, the same tube, except that it used a thoriated filament, required five volts at one-quarter ampere. Modern battery-operated tubes require only 1.25 volts at 0.04 to 0.1 amperes to heat their oxide-coated filaments!

Operation Of Diodes

Getting back to the diode, its principal uses are as power-supply rectifiers and signal detectors. Figure 2 shows two power-supply circuits employing diode recti-



Using a home-built 6AG7-807 transmitter running seventy watts, a folded dipole and an NC-98 receiver, David Walker, WNSFPA, Van Buren, Ark., has worked 29 states in a month and a half.

from the commercial, a-c power mains, rather than from batteries, because it helps prevent the alternating heater current hum modulating the tube's output. Too, it is frequently an operating advantage to have the heater and the cathode electrically independent of each other.

A disadvantage of the more-efficient cathode materials is that they are adversely affected by continuous high-voltage fields; consequently, most tubes designed to operate with above about 3500 volts on their plates still use pure tungsten filaments; medium-voltage transmitting tubes use thoriated-tungsten filaments; and all receiving tubes and many transmitting tubes operated at plate potentials of 750 volts or less use oxide-coated cathodes, either directly or indirectly heated.



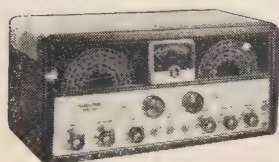
Alan Harper, KN2HLY, Plattsburgh, N.Y., started his amateur career with an old General Electric "All Wave" receiver and an AT-1 transmitter; he worked 14 states in five weeks with this combination. He then got an AR-2 receiver and now has 22 states and Canada.

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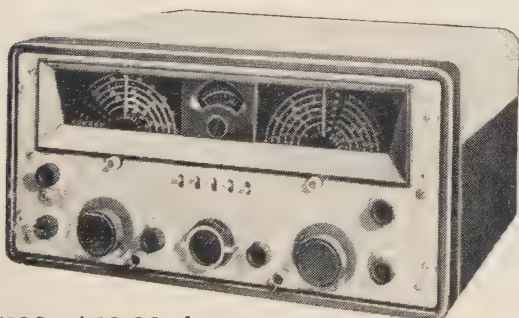
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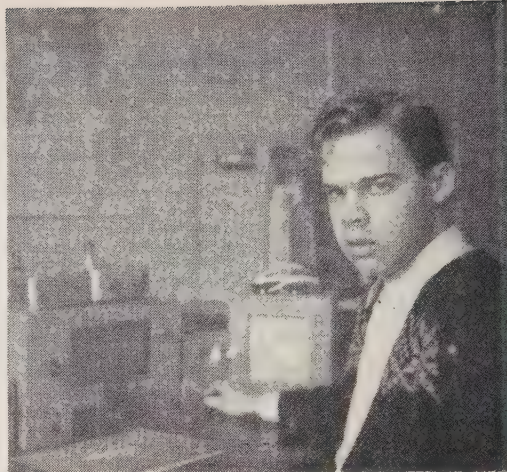
fiers. Figure 2A is a half-wave circuit. The positive halves of the alternating-current wave pass through the diode to appear as direct-current pulses at the cathode. These pulses are then smoothed out by the filter to appear as a pure direct current at the load. Connecting the diode as shown produces a positive output voltage. Reversing it will produce a negative output voltage by passing the negative halves of the alternating-current wave.

Figure 2B utilizes a dual diode—two plates working against a single cathode—and a transformer with a center-tapped secondary to rectify both sides of the alternating-current wave. The d-c output of full-wave rectification is easier to filter than that of half-wave rectification, because each a-c cycle produced two d-c pulses. The half-wave circuit finds its greatest application in so-called a.c./d.c. receivers, where the alternating house current is fed directly to the diode plate.

Diode Detectors

Figure 2A may also be used to illustrate the operation of a diode detector. Instead of low-frequency house current, assume that the input wave is a radio signal, with a frequency measured in millions of cycles per second. Also assume that the load is a pair of headphones. The diode will rectify this signal exactly as before, producing d-c pulses through the phones. These pulses are so close together that only a minimum of filtering is required to smooth them into pure direct current.

Now assume that the radio signal is amplitude modulated; i.e., its strength is varying in accordance with



"Mac," OHIRX, calls himself a Finnish "Novice," but within two years of operating, his fifty watts have worked about 100 countries.

writes; "Although I had had my Conditional license since March, I still read the Novice Shack and work Novice. I have a VFO and run 80 watts on 7 Mc. only. So far I have worked 45 states and would certainly like to make a "sked" with anyone in Vermont, Delaware, and South Carolina. Also with anyone who would like to work a YL (14) in Wyoming. I'd like some pen pal, too."

"Doc," W0FDM (Ivan T. Schultz, M.D., Humboldt, Iowa), forwards a helpful tip: "I thought I might offer a suggestion to those learning Ohm's Law and the power formula. I learned it from my college physics professor and used it while teaching high-school physics.

"To remember Ohm's Law, think of the word ERIE. $E = R \times I = E$, where E is the electromotive force in volts; R is the resistance in ohms; and I is the current in amperes.

"For the power formula, think of what most of us like for desert, PIE: $P = I \times E$, where P is the power in watts, and E and I are as above.

"Knowing these two formulae, it is also easy to calculate power when voltage and resistance or current and resistance are known. When E and R are known: $R = E/R$, rearranging the first formula gives us $I = E/R$; therefore $P = E/R \times E$, or $P = E^2/R$.

When I and R are known: $E = I \times R$; therefore, $P = I \times R$, or $P = I^2 \times R$.

Stanley Wilson, Jr., WN9IFZ, Rt. 1, Washington, Ind. says; "I am on 7 Mc. with an 807 running about 70 watts, a 1/2-wave doublet antenna, and an S-38 receiver.

[Continued on page 67]



"Chic" Barnett, K2BYF, and his brothers, W2DYI and K2BYG, form the Ham population of Newport, N. J. Running forty watts, Chic has worked 41 states and six countries on 80 and 40 meters.

the intelligence it carries. Naturally, the current through the phones will vary in the same manner, and anyone wearing them will hear a reproduction of the original modulation.

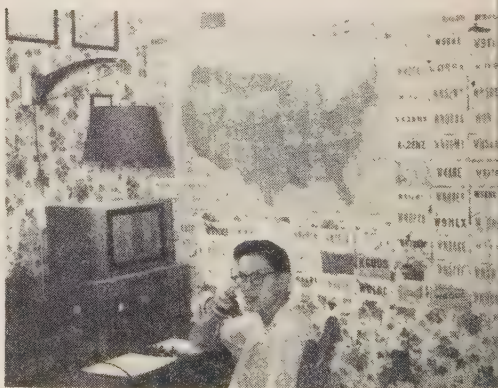
Note that the detector does not actually convert the radio-frequency signal into an audio-frequency signal. Rather, it converts it to direct current, and this direct current increases and decreases in exact step with the modulation. Thus, it is the modulation that produces the audible signals we hear in the phones.

News For And About Novices

As a result of petition presented by James Price, W5FXN, and Tom Walker the Federal Communications Commission in Docket No. 11157, proposes to open the 50-54 Mc. and 144-148 Mc. amateur bands to the holders of Technician Class licenses. Interested parties may file written data in favor of or in opposition to this proposal with the Commission before November 15, 1954. An original and four copies of all data must be furnished.

This docket will undoubtedly be discussed more thoroughly in other portions of this issue of CQ; therefore, I simply mention it here for the benefit of Novice and Technician licensees who are primarily interested in the UHF/VHF amateur bands. I personally am heartily in favor of the idea.

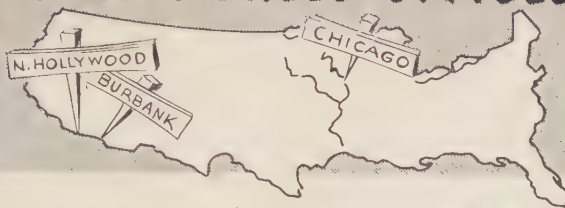
Carol Dugan, W7TQP, 1036 S. Walnut, Casper, Wyo.,



J. David Gattermeier, W0QBX, California, Missouri. The cards on the wall indicate that Dave worked his share as a Novice. He is presently organizing a teen-age net on 75-meter phone.

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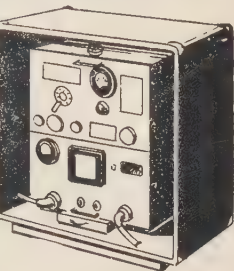
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What You Should Know About Telescoping Towers

WILLIAM I. ORR, W6SAI

Assistant Editor, CQ

First — What NOT to DO

Working on a beam antenna closely resembles the task of building a boat in the basement. If one is not careful during the building of the boat, the day may come when it is necessary to tear out the side of the house to get the boat out of the basement. The analogy applies more closely to a beam antenna than one would think, once the beam is built and placed atop the tower. If one is not careful during the building and tuning of the beam antenna, the day may come when it is necessary to take the antenna down to make some minor repair, or tuning adjustment. To the sorrow of many Hams, getting the beam antenna down to the ground from the top of a thirty or fifty foot tower is no easier a task than getting the proverbial boat out of the basement.

This homely little simile was brought forcibly to my attention during an attempt to adjust a stacked 15 over 20-meter dual array. After the monstrosity had been struggled to the top of the tower, measurements indicated that inter-action between the two beams effectively detuned them both so that they were practically useless.

What to do? Hang by my heels fifty feet in the air retuning the beams, my family (anxiously) and neighbors (hopefully) waiting for me to drop to a sudden end? In addition, every Ham well knows—by the theorem of IPOIO¹ that the wind will start blowing in heavy gusts the moment a foot is placed on the top rung of the tower, no matter how mild the climate at ground level may be.

1. I. I. Scum Diven, "IPOIO," CQ, April 1952, p. 49.

GOING—GOING—GONE. The wide spaced three element twenty meter beam of W6FHR gracefully descends from the operating height of fifty feet to a resting height of 12 feet. The motor driven tower can actually drop the beam below the level of the house roof, when the tower is fully retracted. The fifty foot steel tower, stressed to withstand the heaviest winds, is guy-less and entirely self-supporting. The 25 foot boom is rotated by a surplus "prop pitch" motor, mounted atop the tower. Two selsyn drives are attached to the antenna system. One indicates the heading of the antenna, the other indicates the extended height of the tower. When the 20 meter band is dead, W6FHR shunt excites the tower as a top loaded vertical antenna for 40 and 80 meters!

The only answer was to lower the whole array, make the necessary adjustments on the garage roof, and then to raise it into position atop the tower once more. This looked like a dismal project that would take up at least two good week-ends, that might otherwise be spent working DX, or something equally profitable.

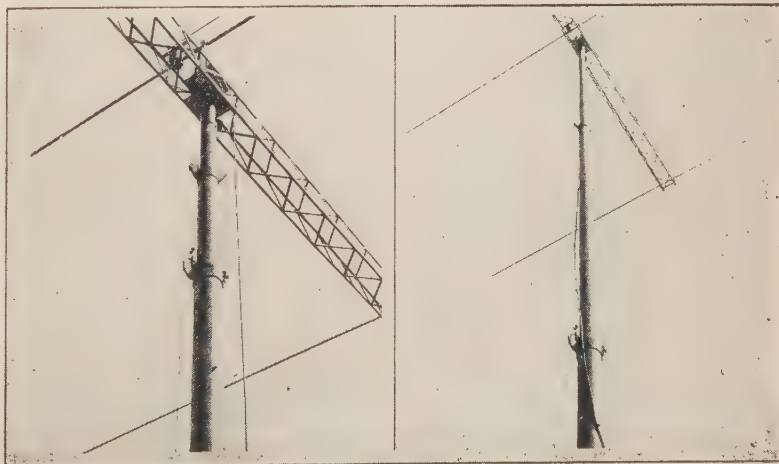
The job was finally done (actually requiring three weekends, during one of which EA9DD was worked by all except W6SAI), and involved a tremendous amount of physical wear and tear. After the completion of this little chore, some serious thought was devoted to the problem of designing a new antenna set-up that would lower the antenna to the vicinity of the ground to permit adjustments to be made with ease, perhaps at the top of a step-ladder.

A Solution

The first thought was to place the antenna and rotator on a little car that would run up a track bolted on the side of the tower.² This would necessitate an un-guyed tower, or one with removable guys. It would also involve some rather close tolerances between the track and the car, plus quite a bit of machine work. In addition, it would be impossible to rotate the antenna at any intermediate elevation, since the tower and track would block rotation of the beam. Since quite a bit of time and money would undoubtedly be expended on the proposed tower, it was felt that rotation of the beam at any chosen altitude was a "must." Just off-hand, I could think of any number of interesting experiments that could be run with a beam that could be elevated as well as rotated. As a final down-to-earth clincher, when the beam is dropped to a low altitude, nothing is visible to the neighbors. The antenna would only be run up into the air when in use. I was convinced and "Project Telescope" was started.

² Anderson and Anderson, "Lower that Beam," CQ, June 1949, p. 28.

Right hand photo — The tower, fully expanded. Left hand — A close-up of the tower in a retracted position. The cable drive system and pulleys may be seen, as well as the mounting plate for the 25 foot antenna boom. The antenna is a wide spaced 20 meter array, fed with a gamma match, and RG-8/U line. Special high-stress pulleys and aircraft-type cable are used as the erecting force. The two pulley bushings are located in the center of the photograph.



The tower-track idea was eventually dropped and a form of telescoping tower, made in concentric sections, that could be raised and lowered by mechanical or hydraulic means took its place. This system possessed three important advantages:

1. As the beam descended, the tower would "shrink," leaving no residue above the beam to antagonize the neighbors.
2. The beam would always be at the "top" of the tower. This solves the problem of turning the beam at various altitudes.
3. If the proper material is chosen for the tower, the required tolerances would be automatically "built-in" the purchased material, thus saving a lot of expensive hand finishing.

Considerable attention was given to the idea of operating the tower hydraulically by means of water pressure. This idea proved to be impractical, as the tower sections would have to be chromium plated and sealed to prevent leakage. ("Put a sprinkler head at the top of your tower and water your petunias as the beam descends," helpfully suggested W6LGU.)

A great deal of weight was given to the opinions of W6FHR, a structural engineer, who had been toying with just such a tower design for some time. We finally joined forces and decided the tower should have the following general specifications:

1. The tower should be made of relatively inexpensive material, such as steel pipe. The construction and assembly should be considered low precision work. This would keep cost to a minimum.
2. The tower should have a minimum height of 18 feet, and should "expand" to a height of 50 feet.
3. The tower should be self-supporting, and no guys should be needed. It should have a safety factor of 100% in a 70 m.p.h. wind, assuming a wind load of 15 pounds per square foot on a 4-element 20-meter beam.
4. The tower should be designed in excess of all local building codes.

5. The tower should have a special fixture at the base, so it could be taken down at a later date, if desired.

6. It should be fool-proof in operation, and designed so as to be jam-proof.

The biggest design battle occurred over the problem of whether or not to use guy wires. If one or two sets of guy wires were added to the tower, it would be possible to construct the tower out of much lighter material. In fact, a braced structure of one-inch tubing could be built, sort of on the order of the Eiffel Tower. Strong arguments were advanced by the "guy the tower" school of engineers, the strongest of which was the monetary savings involved in this type of construction.

After much discussion the problem was boiled

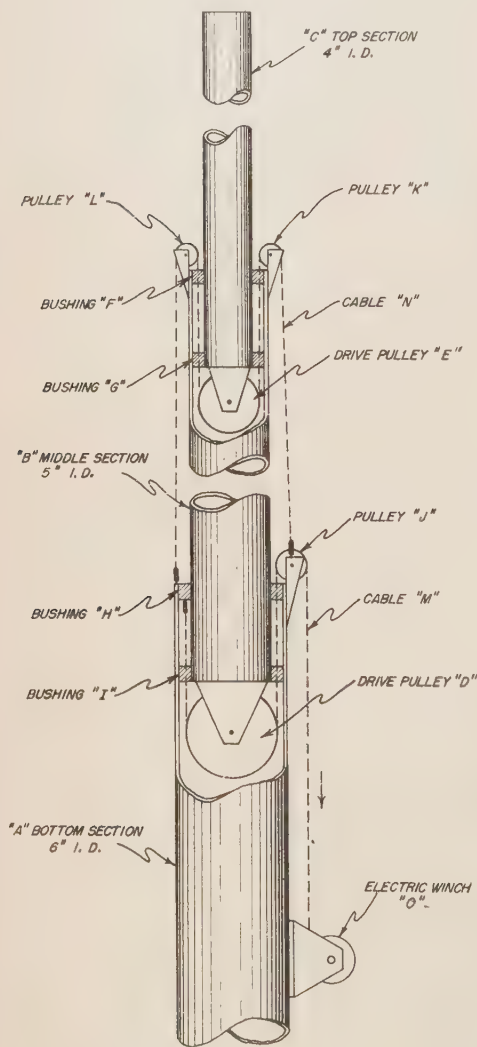


Fig. 1. Mechanics of the tower. See text for all details on operation.

down to the simple decision to restate just what we really were looking for. What was the so-called philosophy of the design? Just what were we trying to achieve?

"The idea is roughly like this," stated W6FHR. "What we want is a structure that will cause the antenna to be raised and lowered at will. It must be 'clean' in appearance and not look like a rat's nest to the neighbor. It must take up a minimum of ground space and above all, it must be strong; I hate to lie in bed at night during a windstorm and wonder when the darn antenna is going to crash about my ears! I don't want a cheap TV-type mast that has to be held up by a bunch of 'antennas' tied to it. Sure, a guy-less tower costs more, but the amount of money put into the antenna is a small fraction of the money the average Ham puts into his station as a whole! I want a tower that's going to last for fifty years, not one that might flop over if a guy-wire corroded on me!"

This passionate appeal convinced even the hardest skeptic—the guyed tower was cast into limbo, and we went ahead with our original design. Finally, with a sigh of relief we shipped the blue-prints off to the sub-contractor for fabrication of the tower.

A few weeks later a large, flat-bed truck pulled up in front of the house. The driver, a cigarette-clinging perilously to his lower lip, vaulted over the door of the cab and accosted me. "Hello, Bud, where do you want this here tower put?" Encouraged by the friendly kibitzing of the five man erection crew that was standing by, he backed his truck to the prepared tower base and gently lowered the tower into position.

Springing into action, the five man team heaved as one, and slowly the tower reached a vertical position. The retaining plates were put in place, and excited hands lifted the three element twenty-meter array to the prepared mounting atop the tower. The coaxial and motor drive cables were plugged into place, and when all was ready, the green "UP" button on the tower control box was pressed, and the tower and antenna rose majestically in the late afternoon air. It was a great moment.

General Design of the Tower

This telescoping tower is made of three sections of seamless steel line pipe, which conforms to A.P.I. 5L Spec., Grade B. This pipe is smooth, uniform and resistant to corrosion. It is about 30% stronger than ordinary iron pipe, and its concentricity is much truer. Each section of pipe is 21 feet long. The base section is 6" I.D., the center section is 5" I.D. and the top section is 4" I.D. An overlap of three feet is allowed at the two center joints, and the bottom section of the tower is embedded seven feet in the foundation. This makes the total overall height of the fully extended tower 63 feet.

[Continued on page 50]

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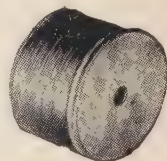
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Attached to the tower, about four feet above ground level is a worm drive unit, with a 30:1 reduction. The use of a worm provides a one way action, that allows force to be transmitted to the cable to raise and lower the tower, but prevents the weight of the tower on the cable from acting through the gear reduction unit to turn the drive shaft. It is possible to erect and lower the tower by means of a crank on the worm drive, but it is a long task, particularly for the usual "out of condition" Ham. It is much better to couple a 1/3 h.p. electric motor to the worm gear, and let it do the hard work. If the motor is used, and limit switches are mounted at the top and bottom limits of tower movement, the tower may be remotely controlled from the operating position.

The Mounting Base for the Tower

The completed tower weighs slightly less than 1,000 pounds. The center of gravity (when the tower is contracted) is only about three feet above ground level. This greatly simplifies the installation problem.

If it is possible to pick up the tower with a crane, a simple mounting base, such as shown in Fig. 2 may be used. A hole three feet in diameter and eight feet deep is needed. In many localities, this is the standard diameter of a sanitary cesspool, and a sewer contractor can dig such a hole with his automatic machinery in a few minutes. A patchwork of 1/2" diameter steel foundation bars is laid at the bottom of the hole. Seven steel bars, eight feet long, are then arranged in a circle of about 2 feet in diameter. Two other bars are bent, forming a 2-foot circle, and are wired to the vertical bars forming a crude cage, Fig. 3. This cage is lowered into the hole to provide internal reinforcement for the concrete to be poured later.

[Continued on page 52]

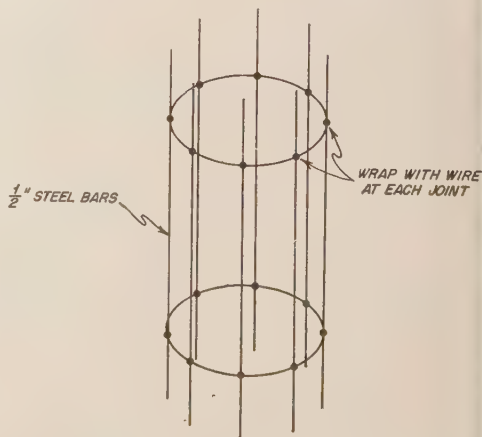


Fig. 3. Wire cage for re-inforcement of the tower mounting base. This is put in place before the concrete is poured (see Fig. 2).

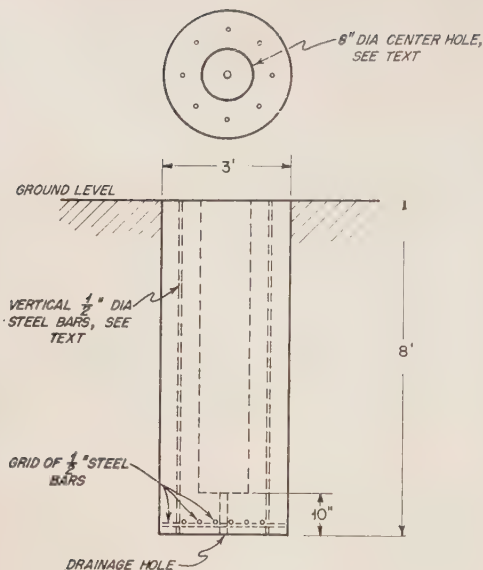


Fig. 2. Suggested base mounting hole.

tended tower 50 feet. When the lattice boom³ is mounted on the top of the tower, the elements of the antenna are exactly 51 1/2 feet above ground.

A clearance of 1/4" exists between the telescoping tubes and in this space is strung the tension cable that raises the tower. The cable is 5/32" diameter, 7 x 19 aircraft control wire. It works at about 30% of its maximum safe load. The top end of the large tube, both ends of the center tube, and the bottom end of the top tube are all shimmed to provide a close slip fit between the tower sections. The circular shim, about 1/4" thick, may be turned out on a lathe, and held in final position on the tower with Allen set screws.

In order to keep the three sections of the tower aligned for proper cable action, the two moveable sections of the tower are keyed by a 1/2" x 1/4" key, extending the full length of the tubes. A corresponding keyway is cut in the top bushing of each moveable tube section, just large enough to pass this keyway.

The Drive Mechanism

An electric winch (O) winds up the main drive cable (M). An upward lift is exerted on the drive pulley (D) mounted on the inner section of pipe (B). The far end of the drive cable is clamped to fixed bushing (H). The bushing (I) slides with the center pipe section. A separate cable section (N) and pulley-bushing assembly (K, E, L, F, G) elevates the top section (C) when the center section moves. Special jam-proof high strength pulleys are used in this "lift-yourself-by-your-bootstraps" operation.

3. Orr and Abrahams, "A Lattice Boom for 14 Mc. Antennas," CQ, April 1951, p. 21.

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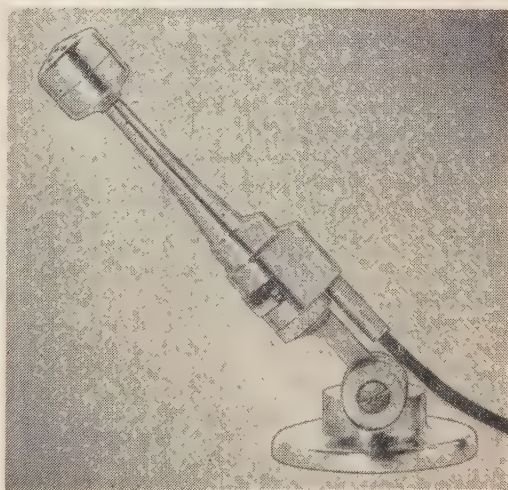
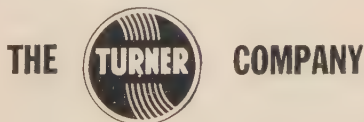
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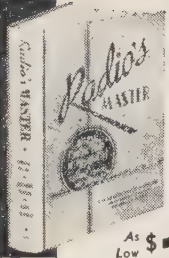
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TELESCOPING TOWERS

[from page 49]

It is next necessary to make an inner core, or form, about 8 inches inside diameter which can be dropped inside the cage, to provide the central hole for the tower. The best bet is an 8-foot length of eight inch thin-wall steel tubing. This is lowered into the hole, and aligned in a true vertical position by means of a few sticks of wood, and some wire stays.

When all is ready, the cement should be slowly poured into the area surrounding the central pipe. When the cement nears the top, the retaining bolts with their wooden template (to be described later) should be put in place, and the cement poured around the retaining

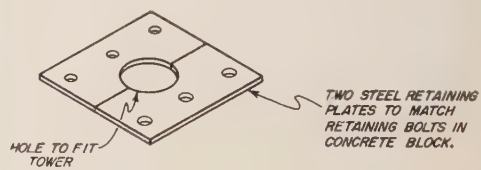


Fig. 4. Tower retaining plates.

bolts. The retaining plate should rest just above the top of the 8-inch pipe, clearing its top lip by perhaps 1/2 inch or so. The cement should be allowed to harden for six or eight days before the antenna is placed in the mounting base.

Retaining Devices

When the tower is in a vertical position in the base, the area around the tower may be filled with sand, which should be wetted down and packed into place. The retaining plate should be bolted into place, and the tower is ready for operation.

The tower retaining plates are cut of 1/4" sheet steel stock. When placed together, they have a hole cut through the center with a torch that will just pass the outside diameter of the tower. Each section of retaining plate has three 1" diameter holes cut in it to anchor the plate to the retaining bolts sunk in the concrete form. After the retaining plate has been made, a wooden template of the sections should be made of 3/8" plywood. The retaining bolts are bolted to this template before they are sunk in the concrete, thus insuring a proper fit between the bolts and the retaining plates.

Tower Maintenance

The tower requires a very minimum of upkeep. Before it is erected, the complete tower should be given a good coat of red lead paint,

then a final color coat that will blend into the surrounding objects. A gray-blue is very effective at de-emphasizing the tower to the neighborhood. The erecting cable, the two top tower sections and the pulleys and gear drive should then be given a liberal coating of grease.

Results

The beam has been deliberately left up in high winds with no signs of vibration or deflection of the tower. Exceedingly interesting results have been obtained on both short-skip and DX contacts when the beam has been elevated and depressed. For extreme DX work (The W6-Europe path) it has been found that the maximum height of 52 feet is best. As the beam is slowly dropped from this height, the Europeans become more hollow-sounding and drop off in signal strength. At 52 feet it is comparatively easy to work European phone signals through the east coast QRM. At a 30-foot elevation this is almost impossible. "Skip" to the east coast is also optimum at the full elevation of 52 feet. At this elevation, the main lobe of the beam is at an angle of about 18°. This is still a little high for optimum results to Europe, as the signals from that part of the world should arrive at angles between 5°-10°. However, an angle this low calls for a tower height of 70 feet or so—out of the question!

As the desired skip length decreases, the optimum height of the antenna also decreases. A height of about 40 feet is optimum for W8 and western W4 stations—a skip of about 1800 miles. A thirty foot height is deadly into the WØ and W5 areas. On short-skip within the W6 call-area, a height of 20 feet or so is optimum.

Local Effects and TVI

One of the most valuable features of the antenna is its uncanny ability to attenuate local signals. In the Los Angeles area on a busy Sunday, operation on 20 meter phone is almost impossible because of cross-talk between local high power phone stations. It is now possible to find a certain height at which particularly loud local signals may be greatly attenuated, possibly by a correct out-phasing of the direct and indirect ground waves. This ability alone makes the tower well worth its initial cost. Local signals that completely paralyze the receiver become merely a strong signal when the height of the tower is changed five feet or so.

Interesting results are also obtained with regard to TVI. The 1 kilowatt transmitter used with this antenna is 100% clean TVI-wise. The only problem is primary blanketing of nearby receivers. As the tower is run up in height, the blanketing effect slowly drops off, and is less severe at 52 feet than at 35 feet. At 35

[Continued on page 54]

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A-5X	4.00	Single button mike to p.p. grids—Hi-gain.	300-3000	100	84

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M-3X	5.60	10000 C.T. for 6N7, 6A6, 6F6's, etc.	300-3000	3000 5000-8000	100	20
M-7A	14.45	4250 C.T. for 807's.	300-3000	3000 5000-8000	200	60
M-8A	21.20	Multi-match.	300-3000	4000 to 20000	200	80
M-12A	22.50	Multi-match.	300-3000	4000 to 20000	300	125

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[from page 53]

feet, even a high-pass filter on the TV set is not enough to completely free the screen of interference. At 52 feet a high-pass filter is not needed on a well-designed TV set. We have since found that maximum interference occurs when the antenna fires directly into the power lines.

There is no doubt that this power line affects the operation of the antenna. Loading of the transmitter and the SWR of the coaxial feed line both fluctuate violently when the antenna fires into the power line. Checks with station located in the line of fire of the beam when it is aimed at the power line report a very marked drop in signal strength when the beam lies in the plane of the power wires. The beam is located about 40 feet from the line.

Once a tower of this type is used, where variable height as well as rotation may be had at the push of a button it can easily be seen that elevation is as important as rotation of a beam antenna.

Editor's note: Because of the interest in this remarkable tower, W6FHR has made arrangements for the construction and assembly of this tower for interested parties. Information may be obtained by writing to Lewis H. Abraham, 11339 Gladwin St., Los Angeles 49, Calif.

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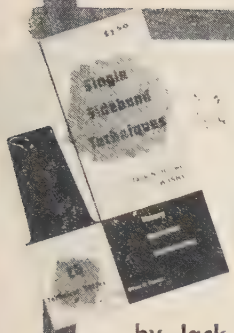
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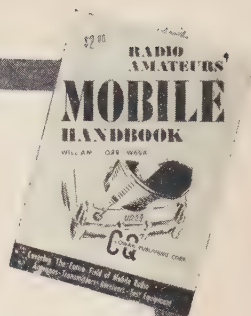


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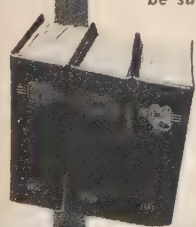
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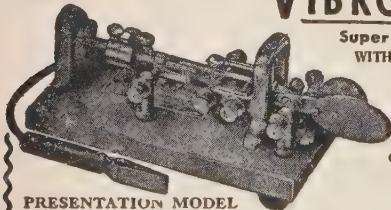


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pulse normally obtained from the distributor to advance the tape transmitter to the next set of perforations. This takes place during a portion of the "stop" pulse immediately following the fifth selecting pulse.

Indicating Lamps

In series with the winding of each of the polar relays is a pilot lamp which will indicate the coded output of the matrix at a glance. In normal typing these lamps flicker very rapidly as they are only on for about twenty milliseconds. If they are used for testing the matrix or as an aid in memorizing the code (not particularly needed, but it does come in handy for trouble shooting) the distributor should be shut off, permitting the lamps to stay on as long as a key is held down. It might be a good idea to reduce the 12 volts to 6 (select the center-tap of the transformer) when doing this. These lamps will take away all the mystery surrounding the operation of the matrix and are quite interesting to watch during typing. Further, the lamps act as series resistors which limit the matrix current to a safe value since the relays have low resistance windings.

The relay strip is mounted on a standard rack panel 19" x 13 1/4" as shown in Fig. 2. The relays are mounted on an aluminum sub-panel 17" x 1 11/16" which is supported three inches from the rack panel. At the left is an eleven-prong male Amphenol plug which connects to the distributor. Next is the B-199 telephone-type relay for lockout. Then there are the five polar relays for storage (*numbers 1 and 4 have their covers removed*), and finally the octal socket which connects to the keyboard. Under the subpanel is the filament transformer, the restoring rectifier (composed of a single 1" square selenium plate divided into six cells of which one is unused), and the indicating lamps. The lamps might well be mounted on the front panel for a more flashing appearance (ahem!).

Distribution

Teletype tape distributors are the simplest solution to the problem of putting the impulses in time sequential order. These devices are still in good supply and are not expensive. Since most amateur teletypewriter operators ultimately install tape equipment for automatic sending, this piece of equipment will eventually be needed anyway and might as well serve a double purpose. An all-electronic distributor will be the subject of a future article. For purely local operation no distributor is required since all that is necessary is to wire the contacts of the keyboard relays directly to the typing unit selector-magnets. Were it not for FCC

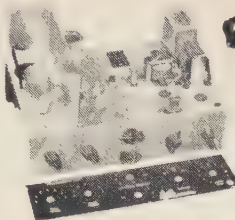
[Continued on page 60]

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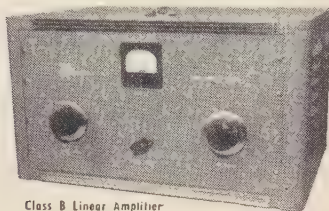


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Complete with tubes and reel. Approx. wt. 65 lbs. Excl. cond..... **\$14.95**

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regulations to the contrary we could send five different tones simultaneously over the air, detect each one separately and feed the d.c. resultant to the indicated selector-magnet.

More Information

The primary source of teletype information and equipment is the V.H.F. Teletype Society, 38-06 61st Street, Woodside 77, N.Y. If you have further questions about this article, or about getting started on RTTY, contact the Society.

In a future article, I hope to be able to explain a method of generating Morse code with this type matrix. It will permit the standard RTTY setups (tape) to send CW at any speed from one to a hundred words per minute.

PROPAGATION

[from page 33]

remarkable increase in intensity as the moon covered the sun. Waves of such frequencies are generally transmitted better by day than by night showed a corresponding decrease in signal intensity. The eclipse effect was definitely a night effect, indicating a temporary decrease in the electron density of the ionized layers as a result of the decrease in ultra-violet radiation reaching the ionosphere from the sun because of the blocking effect of the moon.

The next total eclipse of the sun will occur on June 20, 1955, with the path of totality extending across the Indian Ocean, southern India, and across southeastern Asia to the North Pacific Ocean. This eclipse will not be visible as a total eclipse in the United States.

Mail

During the past year the amount of letters received from readers of this column has increased considerably. If you have a specific question concerning radio propagation that you would like answered, or a comment concerning this column, send it directly to W2PAJ, c/o CQ Magazine. Please enclose a stamp addressed envelope for each letter to be answered by return mail. Please allow at least two weeks time for reply to specific questions. Next month we will discuss some of the questions asked during the past few months by readers of this column.

YL'S FREQUENCY

[from page 31]

ship as 339, contained many features and anniversary greetings from people prominent in the radio world.

In January, 1950 a new contest was added, the YL-OM Contest. Since then also, YLRL has issued many awards for WAS/YL to Hams who have worked a YL in each of the 48 states, WAC/YL (for working a YL on each continent), and the newest award, YLCC, for working one hundred different YL operators.

In recent years YLRL has become decidedly international and now has members, in addition to the U.S., Alaska, Canal Zone and Hawaii, in Australia, Canada, Chile, Czechoslovakia, Ecuador, Germany, Great Britain, Italy, Mexico, Mozambique, Netherlands, New Zealand, Panama, Peru, Puerto Rico, Southern Rhodesia, and Union of South Africa. Total membership has reached over 500 YLs!

Now YLRL starts on its 16th year—a year which promises to be the biggest yet. With enthusiastic officers and big plans (see "YL's Frequency," CQ, July and Sept. 1954) we can look forward to increased membership, continued fine contests, refurbished treasury, big issues of YL Harmonics, a new edition of the YLRL Callbook, and the first national YLRL convention (to be sponsored by the Los Angeles YLRC, place and date to be announced soon).

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First Officers

Before we look too far ahead, let's go back to our very first officers, the ones who started us on such a successful course.

At the time our first president, W7FWB, wrote her new famous letter, she was very active on the air from Wenatchee, Wash., having received her license in 1936. Ethel was especially interested in AARS and in '41 was district net control in her state. After Pearl Harbor she

YLRL 15th Anniversary Party Rules

- Dates:** Phone—Start Sat. Dec. 4, at 1200 EST. End Sun. Dec. 5, 2400 EST.
CW—Start Sat. Dec. 11, at 1200 EST. End Sun. Dec. 12, at 2400 EST.
Operate no more than 20 hours on phone and 20 hours on CW.
- Frequencies:** All bands. Cross-band operation, phone to phone and CW to CW, is permitted.
- Eligibility:** Contest open to any licensed YL or XYL operators throughout the world. Not limited to YLRL members. Contacts with OM's do not count.
- Procedure:** Call "CQ YLRL."
- Exchange:** QSO number; RS or RST report; name of State, U. S. Possession, VE District or Country.
- Scoring:**
a—5 points for each contact.
b—Same YL may be worked on other bands for additional credit.
c—add number of points and then multiply by number of different States, U. S. Possessions, VE Districts and Countries worked. Maryland and District of Columbia count as one state.
d—All phone contestants running 150 or less watts input at all times may then multiply the final score by 1.5.
e—All CW contestants running 150 or less watts input at all times may then multiply the final score by 1.25.
- Awards:** Highest phone score—Cup
Highest CW score—Cup
(These cups are awarded on a yearly basis. Any operator winning the same cup three times gains permanent possession of it.)
2nd and 3rd place awards to be donated.
Certificate for high score for phone and CW in each U.S. District and Country.
- Logs:** Copies of phone and CW contestants logs must be postmarked not later than Dec. 31, 1954, to be sent directly to Gilda Shoblo, W6KER, Vice President YLRL, 3715 Liberty Blvd., Southgate, California.
When submitting copies of logs, please list phone contacts and CW contacts separately.

was called to the Presidio in San Francisco. Thereafter she served at Ft. Douglas, Utah; Quonset Point Naval Air Station, R.I., and the Seattle Naval Air Station. For the last nine years she has been an Electronics Engineering Aide at the Naval Research Laboratories in Washington, D.C.

Ethel is not now very active on the air, but is very much so in club work. She is president of the new radio club at NRL (W3NKF), secretary-treasurer of the Washington TVI Committee, and treasurer of the Society of Women Engineers. She also is a member of the Washington Radio Club. Her apartment QTH makes operating her present station, W3MSU (a Viking I and HQ-129), almost impossible, but she does get on from W3NKF and mobile with her 10-meter rig.

YLRL's first vice president, W9WWP, licensed in 1936, was a sophomore at the Univ. of Illinois when YLRL got under way. After getting her degree at U. of I. (in Home Ec.), Carol went to work as Asst. Engineering Aide in BuShips. In 1942 she became the first woman

[Continued on page 63]

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ARC-4 TRANSCIVER. Complete, less dynamotor.	
Used.....	14.95
BC-442 ANTENNA RELAY UNIT. Used.....	2.95
R-28/ARC-5 RECEIVER. Used.....	9.95
T-23/ARC-5 VHF TRANSMITTER. Complete, used	14.95

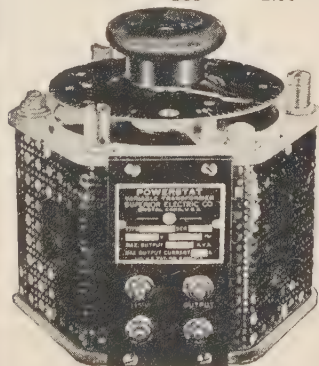
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1AB5	.20	4X500A	70.00	813	7.95
1N21B	1.75	5B1P	2.00	815	2.25
1N22	1.00	5B4P	2.50	816	1.00
1N23	1.25	5C22	25.00	826	.45
1N23A	1.65	5R4WGY	1.50	829	5.00
1N23B	1.75	5Y3GT	.45	829B	8.95
1N26	4.75	6AC7	.70	832	5.00
1N31	2.00	6AK5	.45	832A	6.00
1N38	1.00	6HG	.35	836	2.50
1N41	6.95	6J6	.59	837	1.00
1N42	12.50	6SN7G1	.69	854	25.00
1N44	.85	7CP1	4.95	866A	1.00
IP30	.69	12AT7	.89	872A	1.50
1R5	.60	31Z	2.00	954	.20
1S5	.55	FG154	25.00	955	.30
IT4	.45	211/VT4C	.75	956	.30
2C39	7.50	274B	1.00	957	.35
2C39A	12.00	314A	100.00	958A	.50
2C44	.75	316A	.29	1625	.25
2K22	15.00	342A	300.00	1629	.20
2K25	17.50	350B	4.00	2050	1.10
2K26	45.00	403B	3.00	2051	.75
2K28	30.00	431A	P.U.R.	5644	10.00
2K41	70.00	437A	125.00	5654	1.65
2K45	75.00	438A	P.U.R.	5677	2.50
2K54	50.00	446A	.89	5696	1.65
2K55	50.00	454H	P.U.R.	5719	4.00
2K56	70.00	464A	2.95	5725	2.75
2X2A	.75	471A	1.95	5726	1.25
3BP1	2.75	KU627	15.95	5749	1.50
3B24	4.50	717A	1.00	5750	1.75
3C22	65.00	723A/B	10.00	5751	2.50
3C24/24G	.89	726C	35.00	5814	1.65
3D22	7.50	800	1.00	5902	6.00
3EP1	1.00	801A	.29	6005	2.50
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3FP7	1.50	805	2.25	6112	7.00
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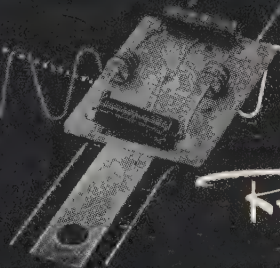
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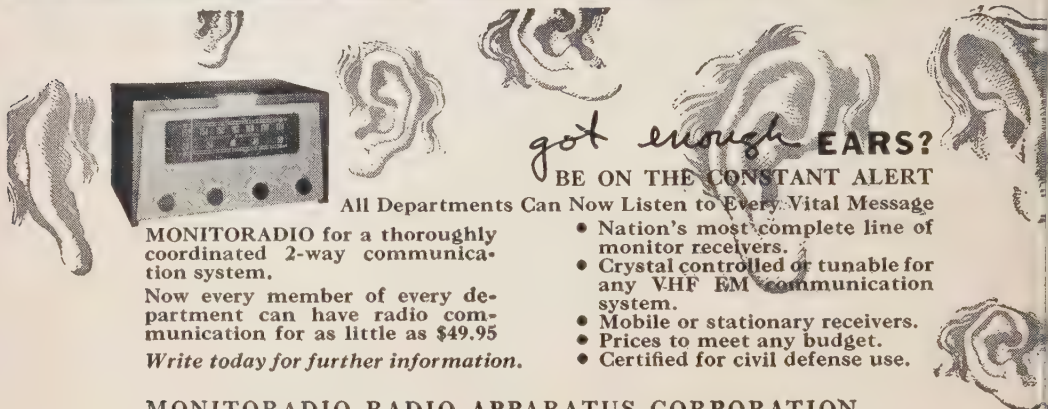


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STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF CQ, published monthly at New York, N. Y. for October 1, 1954.

1. The names and addresses of the publisher, editor and business managers are: Publisher, Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.; Editor Oliver P. Ferrell, 67 West 44th St., New York 36, N. Y.; Business Manager, Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N. Y.; Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgagees, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and beliefs as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) S. R. COWAN, Publisher

Sworn to and subscribed before me, this 20th day of August, 1954.

HARRY N. REITZES, Notary Public

Give the United Way

staff member at ARRL with a call, serving first as Asst. Comm. Mgr. and then as Acting Comm. Mgr. Then she spent a year in the WAVES hospital corps.

As W6WSV, the QTH is South Pasadena, Calif., where Carol shares with OM, W6WSW, an HQ-140X and a rig consisting of a 5763 xtal, 6146 final, running 65 watts, on 20 CW. Carol has been active in the Los Angeles YL club, was its first president, has served as P/C, and this year is 6th district chairman for YLRL. Chief occupation: cook and nursemaid to Marcia 6, and Michael 2.

First secretary-treasurer of YLRL, W9NBX, Enid Carter, put Bowbells, N.D., on the map with her issues as editor of YL Harmonics. For some time she has been permanent librarian of YLRL. Enid was licensed in 1936, and for many years was very active on 80, 40 and 20 CW, keeping up with the fastest ops. She also participated in AARS. Enid met her OM, W6ZD, via the Ham bands. Now Enid Aldwell, W6UXF, she is located in Los Angeles. Enid says she is completely out of the Ham game at present. She and her OM have taken up German and Austrian folk dancing and spend all their spare time with practicing, exhibitions and research into authentic dances, music and costumes.

YLRL's first publicity chairman, W8TAY, Nita (now W4JCR), held that post for five years. She has had many jobs in YLRL and is now chairman of its constitution committee. Always an enthusiastic booster of YLRL, it has been from Nita's files and early issues of YL Harmonics that much of our data on YLRL's beginnings has been gleaned.

YLRL Nets PHONE

Band	Freq.	Day	Time	NCS
75	3900	Wed.	7:00 a.m. EST	W1VOS
	3900	Wed.	8:00 a.m. EST	W4HLF
	3900	Wed.	9:30 a.m. EST	W8ATB (W8HUX alternate)
	3900	Mon.	3:00 p.m. PST	W7HHH (W7SBS alternate)
	3920	Wed.	9:00 a.m. PST	W6PJF (W6QKG alternate)
20	14,240	Thurs.	2:00 p.m. EST	W6UHA
10	28,900	First Tuesday of each month, 9:00 p.m. EST QRMary Net, roundtable		
CW				
80	3610	Wed.	9:00 p.m. EST	W9JTX
40	7034	Tues.	1:30 p.m. EST	W7ROA (W7RLH alternate)

Nita's present work is program director for WISE-TV in Asheville, N.C. Prior to that she was in Radio WISE. For some time she was a recreation director in a V.A. hospital. Wartime service included work in the Intelligence Dept. and she was a training director in Special Services of the Army. Nita says that long ago she was a technical writer and then a lab aid in Brush Development Co. in Cleveland, and before her marriage was a dancer and in the theater. Nita received her Ham license in March, 1939. She and her OM, W4JCS, have a Harvey Wells with Meissner Signal Shifter, and operate all bands.

How Many YLs?

So the YLRL has grown and prospered—but the original question to which an answer was sought remains unanswered. The lace-trimmed ad for "Two Hundred Meters and Down" said "... you won't tell—how many of you YL key-twitchers there are..." Just how many licensed YL operators are there? The 500 members in YLRL are only a portion of all those licensed in the U.S. and elsewhere. This sibyl estimates between two and three thousand. Any other guesses?

YLRL welcomes new members. Dues are \$2 a year and include a subscription to YL Harmonics. For more information about YLRL and a membership-application card, drop your column editor a note at Dulce, N. Mex.

To all of the YLs who assisted in providing data or this account of YLRL's history, our grateful thanks. Till next month, 33, W5RZJ.

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from a wife or husband, member of the family, or
fond friend. Subscribe now — we will send a suitable
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no postage required.



DX NEWS

[from page 42]

... goes to 239 with FB8XX, HK0JH and VR2BZ/ZM7.
W6GDJ made it 233 with ZM7 while W6VE submitted
new list with 227 total. . . W6EFM, helped by HK0CV,
went to 219 as OH5NK moved to 157 with KA0IJ,
JZ0KF, TA3AA, SV0WP and EA9DE. . . KV4AA
moved to 241 with VR2BZ/ZM7 and SV0WK/9 and AL
W2WZ, upped to 234 with VS4HK. . . W9LNM added
HK1GP (HK0AI) and I5PP to reach 224. . . W9HUZ
is now 214 with VR2BZ/ZM7 while Ray, W2BJ, went to
211 with SV0WK/9. . . VK4FJ finally nabbed An-
tarcctica with VK1EG for No. 210. . . W6LGD reached
168 with TA3AA, OD5LX and ZP5AY while Stan,
W9NZZ, rose to 160 with EA9DD, ZC4IP and F8FW/FC.
... Bob, W0TKX, added JZ0KF for No. 187 while
W5KUJ reached 187 with such as LZ1KPZ, VR3A,
F08AJ and EA9DD. . . Pat, W2GVZ, adds one with

New Addresses

ex-DL4YK — W3UYH/7, SFC. Eber F. Diehl Jr.
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Fort Huachuca, Ariz.
PJ2AR — Homer Waits, Lago Colony, Box 720,
Aruba, NWI.
VP7NG — Glen Van Voorhies, RCA Service Co.
Grand Bahama, Patrick AFB, Fla.
ex-W2RX/VO2 — Bob Wilder, 25 Maple Road, Baldwin-
ville, N.Y.
WP4AAA — Ernesto Viera, 170 Arizmendi St. Rio
Piedras, Puerto Rico.
ZAIKAD — Box 69, Tirana, Albania.
ZM6AT — Box 200, Apia, Western Samoa.
Thanks to W7UYE, G6ZO, Ground Wave Magazine (KP4)
and West Gulf Bulletin:

LZ1KSP for No. 179 while W4EPA's attic FD raised
LB8YB for 159. . . Dixie, W2ZVS, upped to 169 with
SV0WK/9 and VS9AS. The same SV0 helped Bill,
KV4BB to No. 188. . . Robbie, VQ4ERR, ups his phone
total to 223 with MP4QAH, EA9DD and NEINMC
(Nepal). . . W0NCG A3'ed to 161 with YU1GM,
F8FW/FC and CR4AD.

W4CTL claims QSO with AC3PT, 7030, 0030 GMT, for
his No. 100. . . W8JGU upped to 150 with ZD6BX and
VS5RO. . . W6UWJ nabbed ZB1AUV. . . Bob,
W6OXS, has finally worked his 100 and awaits QSL's.
... Tom, W4BXV, received his GL and started off on
the long DX trail by nabbing KC4AB. . . K2BYF's
25-watter accounted for CT2BO, ON4TQ, KP4CC and
FI2PZ on 7 Mc. Bill is 12. . . W2ZCZ's attic dipoles
nabbed CX2AM, TF3AB, OH1AA and ZB1KQ. Dick also
nabbed ZL1CI on 8515. . . Doug, W7UYE, with 25
watts is knocking off stuff like PJ2AR, LU8FBH,

Honor Roll Endorsements

(To September 15, 1954)

W0YXO	40-252	W6GDJ	40-233	W0TKX	38-187
W6ENV	40-251	W6VE	40-227	W5KUJ	38-187
W6VFR	40-251	W6EFM	40-219	W2GVZ	39-179
W6AM	40-248	OH5NK	40-157	W4EPA	37-159
G6ZO	40-248	KV4AA	39-241	W2ZVS	36-169
W6MEK	40-247	W2WZ	39-234	KV4BB	35-183
W8POQ	40-246	W9LNM	39-224		
W6SYG	40-246	W9HUZ	39-214	PHONE ONLY	
W8JIN	40-246	W2BJ	39-211		
Z2AGW	40-244	VK4FJ	39-210	VQ4ERR	40-223
W6MX	40-243	W6LGD	39-168	W6VFR	40-181
W6DZZ	40-239	W9NZZ	39-160	W0NCG	35-161

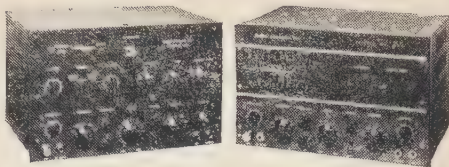
Last complete HONOR ROLL appeared in the
October issue.

L1ADU and assorted KH6's on 14 Mc. . . VE3IG,
Ial, nabbed CR6AI for No. 98. Two more to go before
the three-element Mini-beam goes up! . . . Tom, W0IUB,
received CAA certif. No. 984 and is sweating out KZ5-25.
... KN6ENL nabbed KC4AB on the 7 Mc. Novice band.
... he is W6LGD's XYL! . . . From Takeo, JA1CR, here
are some top DX scores from JA-land: JA1AA 37-133,
A8AA 31-110, JA1CJ 35-108, JA1CR 34-108, JA1DM
35-106, JA1AQ 27-104, JA3AF 33-102, JA6AO 32-97,
A3AA 32-96 and JA1AH 32-90. JA1CR says hardest
one to work is Zone 9. How about that YV's?
... ou, W9ESQ, adds such as KG6FAA, VK9YY, VK6WT,
C4AB and F8FW/FC on 7 Mc. and VQ4BNU, LU8ZS
and ZB1AUV on 14. His latest certificates include WAA
No. 126, CAA No. 772, WPR No. 210 and BERTA No.
39. . . W7VY, Gene, and W5MIS, Tom, also nabbed
R2BZ/ZM7. For the former it was No. 247.

[Continued on page 66]

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Here and There

KV4AA logged visits from KP4UE, W8AJW, KP4W and W5RX. The last mentioned will soon be heard as a new KV4. . . . Bill, W8KPL, is running 15 watts at new QTH in Royal Oak, Mich. . . . W6QQF keys from DL4FF. . . . Alan, VK9YY, leaves for VK2-land in November. . . . Buck, W4RBQ, played host to KC4A1 and Co. coming and going. As a result he nabbed the first KC4 QSL and also a rock paper-weight from Navassa. . . . W7WJV keys from F7CZ. . . . TA2EFA is due to return state-side in November. . . . Prose W2BMX, is now W4CXA near Washington, D.C. . . . From W1DSF we hear that hurricanes Carol and Edna didn't treat the beams and towers of W1FH, W1HOL, W1ADM and W1JDE very nicely. Carol was the main offender and struck around noon on August 31. . . . W6FSJ's recent swing through South America resulted in visits with HK3BO, HK3PC, HK3AB, YV5BY, YV5AO, YV5FL, PY1TD, PY1ADA, PY1ARM, PY9DB and CX5AF to name a few. . . . KG4AK returned to states in September and planned mobile operation with ELMA4 gear. . . . Bill, W5DGV, reports that some idiot broke into his shack with grand larceny in mind. Being unable to dislodge the transmitter he wound up by swiping all Bill's QSL cards beginning with the 1 prefixes. Some of these are replaceable but he sure would like duplicates of the following: ZB2B, ZD4AM, ZB1AR, ZD2DYM, ZD6DH and ZM6AK.

Carl, W8BTI, and XYL visited W4RBQ. . . . W7NCC now keys from W6YUS. . . . We hear that Pat, W2AIS ex-ZC8PM, is now back at sea. . . . YU1AD reports a swell time had by all at the YU Hamfest, Ljubljana, August 19/22, visitors included G2MI, G5NU, DL1CU, DL1DH, DL3VG, DL3SG, DL9PR, HB1AG/HE, DJ1BQ, DJ1BV, SV1SP, OZ1FM, OE5HN, OE6HK, OE6FO, I1BCB/Trieste and YU1GM/W4GMP. Mirko nabbed the 10,000 dinar prize for the best home-made rig but this

Japanese Certificate

In addition to the AJD (All JA districts) and the WAJD (Worked all JA Prefectures) the JARL awards the JCC (Japanese Century City) award to any station submitting proof of QSO with 100 cities in Japan. There are 380 cities in Japan. 10 IRC's must accompany applications. (This should be a tough one!)

amount (about 35 bucks) was quickly dissipated during the night's revelry. . . . W1ZL had three feet of water in the shack when hurricane Carol came by. When Edna was announced he dismantled the rig—That's right—Edna passed him by! . . . YK1AJ belatedly advises us that a 500-watt station signing YK1DF was active from September 2 to 30. It was operated in connection with the Damascus International Fair. Each W station worked will have his call entered in a lottery for various prizes which will be sent to the lucky winners! . . . Dave of KA9MF advises that this station belongs to the "Hokkaido Amateur Radio Club" and is on the air almost 24 hours daily. Transmitters are a BC-610 and WR. Globe Champion while a Collins 51J-3 and NC-125 do the inhaling. Antennas consist of a three-element beam on a 90-foot steel tower and a 10-wavelength sloping Vee beam. 90 countries have been worked since operation commenced in November 1953 and only South Carolina is needed for WAS. 21 and 28 Mc. activity planned soon and KA9MF is looking for many countries in the Caribbean area. QSL's go out 100 per cent. QTH: KA9MF, Field Station 8612 AAU, APO 48, PM San Francisco. . . . Ned, W1RAN, visited W4KFC W4PNK and others in Va. . . . KP4-land has finally passed on to three letter calls with the assignment of WP4AAA.

160 Meters

It's time to check your "long wires" in anticipation of what is hoped to be the best "top-band" season ever. It is known that VS6CQ will be on and possibly a few JA stations. Via W1BB we learn that the annual 160 meter TRANSATLANTIC TESTS will take place between 0500 and 0800 GMT on the following dates: December 5 and 19, January 2, 16 and 30, February 13. See you there!

THE NOVICE SHACK

[from page 48]

In 40-odd days, I have worked 27 states. Best DX is California. As I do not get out very well at night, I write letters and re-read the Novice Shack. I hope to get on 3.7 Mc. soon. I am 16 years old and am a Junior in High School."

John Thompson, WN8SAQ, 8500 Concord Hills Circle, Cincinnati 27, Ohio, says, "I am writing to tell you of the wonderful results I have had in QSL'ing. Out of 35 cards sent, 2 have been answered. In a short period of operating time, I have contacted 7 states, all confirmed, using a home-brew, 6L6 transmitter and an S-38C receiver."

Jim Stebbins, WN8SYV, 1856 Cornelius, S.E., Grand Rapids, Michigan, writes: "I have been a Novice for 11 days and have worked 17 states, all in the last 8 days. But working them and having them confirmed are two different things, hi. I run 40 watts and use an NC-57-B receiver. My antenna is a folded dipole and my frequency is 7189 kc. WN8RUQ, WN8SKA, and I have organized a little club of Novices only. We are going to hold contests for the best DX, hi."

K. J. Farnsworth, WNTWLV, 3708 S. 23rd E, Salt Lake City, Utah, writes: "I never realized how many Hams there were in Salt Lake City until they turned up after my name appeared in the "Help Wanted" department in the Novice Shack. Thanks a lot for printing it. . . . Been on the air 8 days now and have had 31 QSO's in 9 states."

Hy Slo-Bodkin, 177 Rugby Road, Brooklyn 26, N. Y., reports, "I am a short-wave listener (SWL). Since November, 1953, my percentage of replies to reports mailed to amateurs has gone up from 28% to 34% at the present. Has any other SWL done as well? I would like to hear from those who have."

Gerald Lasitter, WN4GRY, 81 Third Ave., Prichard, Alabama, gets right to the point. "If anyone ever tells you that lightning never strikes twice in the same place, don't believe him. On August 15, lightning struck my antenna twice within two minutes. Luckily, no damage was done. . . . "I run 50 watts to a Globe Scout and use a doublet antenna. Receiver is an S-77A. In three weeks, I have worked only five states, mainly because I do the housework while my mother is working. My greatest confirmed DX is 600 miles."

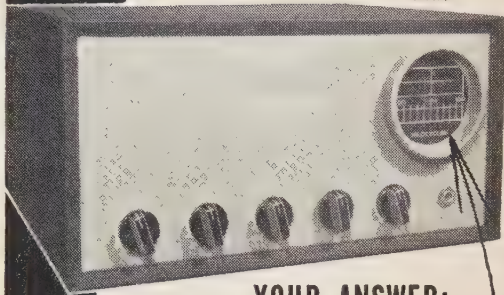
Terry Long, WN9HNJ, 40 West Harrison Ave., Wabash, Ave., writes: "I have been on the air 18 days and have had 51 contacts in 12 states. I hope this clears up my address for some of the fellows I worked."

Lloyd, KN2ICK, wondered if he would have to take the written test over again when he applied for his General-class license, seeing that he had already passed his Technician-class examination before an FCC examiner before the rules were changed. The answer is, if you qualified for a Technician-class license at an FCC office before the rules were changed, you can qualify for General-class license simply by passing the 13-WPM code test before an official FCC examiner.

David Gattermeir, W0QBX, 106 High, California, Missouri, writes: "I am now a General. While a Novice I used 6AQ5-807 rig feeding 3.7-Mc. and 7.2-Mc. doublets, and an S-40 receiver. I managed to work 36 states and Canada, mostly on 3.7 Mc. I might add that I worked just as far and got better reports on 80 than on 40 meters—well almost as far. I can't see what everybody as against 80 meters. . . . I sent out 170 QSL cards as Novice and received 160 in return. I use a plain, but attractive card and filled it out neatly. And I do not wait for the other fellow to send his card first. . . . I am now using a VIKING I transmitter and an RME-45 receiver. Both used, but work well, with appearance to match."

Miss Patsy Nikodem, 1800 So. 69 St., West Allis 14, Wisc., says: "Here's an SWL-W9 knocking at your Novice Shack door. I don't know whether I am welcome before I get my license, but here I am. My receiver is only an S-38C, but it sure pulls in signals from far-off places. I also have a "Sky-Rocket" transmitter that V9IQY built for me. It runs 15 watts, and it really gets out. A couple of my friends have had it on the air." Sam, WN4GHS, seems a wee bit bitter. "I think any Novice who uses a 'Bug' key on the air without first

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WHAT... spots are free
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[Continued on page 71]

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1900	2515	2875	3145	6125	7073	7730	8090
1915	2520	2880	3150	6140	7075	7740	8091.7
1930	2525	2885	3155	6142	7100	7750	8100
1940	2530	2890	3160	6150	7106	7760	8106.6
1950	2535	2895	3165	6173	7125	7770	8108.3
1965	2545	2900	3170	6175	7140	7780	8110
2015	2550	2905	3175	6185	7150	7783.3	8116.7
2017	2557	2915	3200	6200	7160	7790	8125
2020	2560	2920	3202	6202	7173	7800	8130
2025	2565	2925	3205	6215	7175	7810	8133.3
2035	2570	2930	3210	6235	7200	7820	8140
2040	2575	2935	3220	6240	7206	7830	8141.7
2055	2580	2940	3225	6250	7225	7840	8150
2060	2585	2945	3230	6273	7240	7850	8158.3
2065	2590	2950	3235	6275	7273	7860	8160
2090	2595	2955	3240	6300	7275	7870	8163.4
2105	2600	2960	3245	6320	7275	7880	8161.7
2125	2655	2965	3300	6315	7306	7890	8170
2130	2660	2970	3310	6325	7325	7891.7	8173.3
2135	2665	2975	3320	6335	7340	7900	8175
2140	2675	2980	3340	6340	7350	7910	8180
2195	2680	2985	3410	6350	7375	7920	8183.3
2300	2685	2990	3420	6362	7400	7930	8190
2305	2690	2995	3435	6373	7406	7930	8191.7
2320	2695	3005	3465	6375	7425	7930	8200
2350	2700	3010	3500	6405	7440	7960	8206.6
2355	2705	3015	3525	6406	7500	7970	8208.3
2360	2710	3020	3640	6425	7510	7980	8210
2795	2750	3025	3655	6440	7520	7990	8216.7
2370	2755	3030	3680	6450	7530	8000	8220
2375	2760	3035	3700	6473	7540	8006	8225
2390	2765	3040	3760	6475	7550	8008.3	8230
2415	2770	3045	3800	6500	7560	8010	8233.3
2430	2775	3050	3825	6506	7570	8016.7	8240
2435	2780	3055	3885	6525	7580	8020	8243.3
2440	2785	3060	3955	6540	7590	8025	8250
2442	2790	3065	3980	6550	7600	8030	8253.3
2450	2795	3070	3990	6573	7610	8033.3	8260
2455	2815	3075	3995	6575	7620	8035	8263.3
2460	2825	3085	6000	6600	7630	8041.7	8270
2465	2830	3100	6006	6606	7640	8050	8273.3
2470	2835	3105	6025	6625	7650	8058.3	8280
2475	2840	3110	6040	6640	7666.7	8066.7	8283.3
2480	2845	3115	6042	6650	7670	8066.7	8290
2485	2850	3120	6050	7000	7680	8070	8293.3

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2670 DC-34	2.99	3000 KC. FT-243 1.99
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For Sale:

ATTENTION BEGINNERS and Novices: S-38C receiver and Instructograph Jr. with 5 tapes. Both practically new. All for \$59.95. Barry Sorkin, 1084 New York Ave Brooklyn 3, New York.

SURPLUS-RG-8/U cable 100 ft. \$5.95, 250 ft. \$13.25, 500 ft. \$25. New connectors: PL-259 and SO-239 5 ft. \$2.00. New oil-filled condensers 600WVDC 2 μ d 69c μ d 90c, 7 μ d 95c, dual 8 μ d 1.95; 1000 WVDC—1 μ d 69c, 2 μ d 90c, 4 μ d 1.59, 8 μ d \$3.25. AN/AP5-13 42 Mc. transceiver with 17 tubes \$22.50. Postage extra. Request new bargain bulletin. Find new store for thousands of unadvertised bargains. Wanted to purchase—surplus radio equipment. Navy synchros. Electronic Research 717 Arch Street, Philadelphia, Pa.

FOR SALE: Late model HQ129-X with speaker, KV final-250TH's with power supply, 28" Bud cabinet, and assorted parts. All for \$400. Prefer personal pickup. W9QCM, 704 South Walnut Street, O'Fallon, Illinois.

SELL: NC125 & speaker \$125; SX28A \$135, or swap for commercial test gear. K2BJB, 90 West 164th Street New York City.

RADIOTELETYPE—model 12 page printer. UTC S-9 and S-22 Universal transformer and driver, PE-103 generator, old copies Radio News, CQ, QST, and Amateur Radio Defense, W6DOU, 1558 "B" Street, Hayward, Calif.

FOR SALE: Complete station—Hallcrafters S-40B \$74 and Hammarlund 4-20 transmitter with matching Hammarlund 4-11 modulator \$60. CW & fone. Both in good condition. W3SCY, Dave Lavash, 505 Faulk Rd., Wilmington, Delaware.

FOR SALE: Radio controlled Sterling B-6M 28" model cabin cruiser. Complete with hard tube receiver, two tube transmitter, meters, motors. Perfect working condition \$35. Rev. Robert W. Mark, Wellsboro, Pa. W3KOZ

"CLEANING HOUSE": 223AX xmitter with TU17 18 unit plus cables \$30., PE125 power unit \$15, 500 amp Weston Meter Model 271 less shunt, like new \$50., 5 amp Weston Meter Model 273 with shunt, like new \$70.00. Dynamotor 14v. in 600v—300 ma. out, 2 @ \$15 each. MC7-ARC5 modulator less tubes \$8. BC788AM xmitter recvr with tubes and xtal \$15. PE103 motor less base \$10. A5 Automatic Pilot Control Unit \$8. 457 xmitter less tubes & xtal \$4. 4 1/2 μ d condensors 500 v.a.c. 8 @ \$1. each. Plugs: BC375, 522, 274—75c, T12 mike \$1.50. 110v. xformer 10 v.c.t.-12A, 1600 insl. \$4. TU17 & TU1 units \$2. each, 223AX cables 2-PL150 \$1.50 each. H Voltage cables 2-PL59 \$1. each. Write for more information. Joe J. Crowl, 4137 Oleander, Bellaire, Texas

SELLING Collins 75A-2, 148C-1 NBFM adapter, 8R-calibrator, speaker. Excellent condition. First \$325. Also Gonset Tri-band \$25. W0MWD.

A FEW LEFT, GN-39-F DC generators. See page 69 of September issue for details. Easco Communications Co 2611 Goshen Ave., Elkhart, Indiana.

HALLICRAFTERS HT 18-VFO transmitter, still in carton, perfect, \$75. Hammarlund 420 transmitter \$20. BC696-3-4 Mc xmitter \$20; SCR 522 type 2-meter transmitter and receiver \$75. 10-meter beam and tower \$28. LM frequency meter, modulated, with original 110 v.a.c. power supply and calibration book, like new. Best offer! M. D. Welch, 2640 50th S.W., Seattle 6, Wis.

FOR SALE: Filament transformers, 5v, 4 amp. and 10.5v, 1 amp. \$1.00 each postpaid. James Fred, 1508 East 4th St., Mishawaka, Indiana.

Viking II with VFO in excellent condition. Not a scratch on it. \$275. HRO-50T1 & speaker 80-40-20-10 coils, to condition \$275. W9VSF, 903 South Madison, Hinsdale, Ill.

FOR SALE: Complete Gonset mobile unit consisting of Super-SX, Superceiver squelch, Gonset Commander, VF4Mallory 555H, mike and relays. Will sell complete for \$250 or sell by unit. Am interested in trading for receivers or transmitter preferably Collins. Erv Rasmussen, 164 Lowell Redwood City, California.

CLASSIFIED

SAY YOU SAW IT IN CQ

Hobby Necessities:

SCOTCHLITE REFLECTIVE CALL LETTERS. Visible day/night, attachable to any smooth surface by its own tape-type adhesive, weatherproof, 3" high, silver on red, \$1.00 set, postpaid. Satisfaction assured—money back guarantee. Adhesive Tape Products Co., 434 Hudson Street, New York 14, N.Y.

JUMBO LAWN STAKE CALL SIGN, reflectorized, aluminum, complete \$2.75. Overnight service. W2LPG, 133 Airsdale Ave., Long Branch New Jersey.

BE ADMIRER, BE RECOGNIZED, your call letters on a beautifully finished Rhodium tie bar. \$2.00. Val's, 22 Brookshire Road, Hyannis, Massachusetts.

NECKTIES. Your handle, call and antenna towers hand-painted. \$3.00. Give color. Henry Schanding W3RRF, Harrington, Delaware.

QSL Cards:

QSLs! HAM XMAS CARDS! Samples all 10c. Tooker Press, Lakehurst, New Jersey.

QSLs. Snappy colors. Reasonably priced. Samples 10c. Ted Besesparis, W3QCC, Frackville, Pennsylvania.

QSLs of DISTINCTION. Three colors and up. Uncle Fred. Box 86, Lynn, Pennsylvania.

QSL's TWO COLORS, \$2.00 hundred. Samples for stamp. Rosedale Press, Box 164 Asher Station, Little Rock, Ark.

QSLs from Ketchikan to the Ivory Coast "Super-Speed Specials" are the most. Samples 10c Robinson, W9AYH, Dept. B, 12811 Sacramento, Blue Islands, Illinois.

QSLs—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pennsylvania. Samples 10c with catalogue 25c.

QSL's SWL's. Samples free. QSL Press, Passaic, N. J. UNBEATABLE QSLs! Samples 25c (refunded). Sackers, W8DED, Holland, Michigan.

QSLs. Samples-dime, returnable. Printer, Corwith, Iowa.

QSL's. Samples Free. Winston A. Carter, W0LDY, 607 South Oakland, Webb City, Missouri.

Test Equipment:

Test Equipment repaired and calibrated by factory staff. All makes. Hickok, Simpson, Triplet, Heath, etc. Prompt service at low factory prices. Our nineteenth year. Douglas Instrument Laboratory, Norfolk Avenue and Shetland, Boston 19, Mass.

Miscellaneous:

FIRST \$5.00 check or money order takes 25 recent issues RSGB Bulletin and Short Wave Magazine. Brand new. Box GF, CQ Magazine.

PRINTED CIRCUITS: Make your own printed circuits. Kit includes materials and instructions. \$2.95. Felix Outko, 2078 Vyse Ave., Bronx, New York.

CRYSTAL KIT brand new holders & all accessories for complete FT-243 crystals; includes free, two semi-finished and sized blanks for each holder. Packed in hinged-lid, metal box. Kit #1, 25 holders \$2.49; kit #2, 50 holders \$4.49. Easco Communications Co., 2611 Goshen Ave., Elkhart, Indiana.

Wanted:

TOP DOLLAR PAID for ART-13's, dynamotors, parts racks and all other component parts. Write: Harjo Sales Co., 4109 Burbank Blvd., Burbank, Calif.

WANTED ART-13 transmitters. Write James S. Spivey, Inc., 4908 Hampden Lane, Washington 14, D.C.

WE NEED USED RECEIVERS: We give highest allowances for S-20R; SX-71; NC-100; S-40B; NC-125; SX-24; SX-25; HQ-129X; and similar receivers. World Radio Laboratories, 3415 West Broadway, Council Bluffs, Iowa.

WANTED: Instruction book for crystal calibrated frequency indicating equipment Model LM4a. Ted Dell, W4BEX, 454 Highland Ave., Eau Gallie, Florida.

Wanted: Messner 150B transmitter unmodified, or ART-13. M. H. Klapp, W2EQV, 17 Kenosha Street, Albany, New York.

WANTED: Mobile and fixed station gear. Must be reasonable. C. Hockett, W7RXB, Ronan, Montana.

WANTED: Gov't surplus or amateur equipment. Cash or trade for new Johnson Viking, Ranger, Barker & Williamson, Hallicrafters, Hammarlund, National, Elmac, Gonset, Telrex, Central Electronics, Harvey Wells, etc. Need ART-13, DY-17, CU-25, ARN-7, ARC-1, RTA-1B, BC610, BC614, BC939, BC348, BC312, BC342, TCS, teletype, tech. manuals, test equipment. BC221, APR-4, ARC-3, power supplies. List of used transmitters, receivers, on request. Alltronics, Box 19, Boston 1, Mass. Richmond 2-0048.

WANT: Impedance bridge, Q-meter, A.C. VTVM, technical books, tube tester, sweep generator, test equipment.

HAVE: BC342-N and S38-B receivers, Marchant calculator, 100-watt CW and 100-watt phone transmitters, telescope mirror, W9NVC, Box 122, Beloit, Wisconsin.

WESTON LABORATORIES of Littleton, Massachusetts, will purchase your BC-221 frequency meter. Conditions of purchase are that the original calibration book be provided, that the instrument not be altered, and that it be mechanically operable. Write: Weston Laboratories, Box 407, Littleton, Mass.

WANTED: ARC-1. Bill O'Connell, 4908 Hampden Lane, Bethesda, Maryland.

WANTED: Cash paid for BC610 transmitters and BC221 frequency meters. In addition we buy technical manuals, also TCS sets, R5A/ARN-7, ART-13, DY-17, others. Amber Company, 393 Greenwich Street, New York 13, N.Y.

WANTED: Collins 30K-1 or KW1 for cash. W2BBV, 49 Frum Ave., Yonkers, N.Y.

WE WANT YOUR USED GEAR. Highest trade-in allowance on National, Hallicrafters, RME, Hammarlund, Gonset, Morrow, Johnson, etc. C&G Radio Supply Co., 2506-2 Jefferson Avenue, Br. 3181, Tacoma 2, Wash.

AN/APR-4 receivers and tuning units urgently needed! Engineering Associates, 434 Patterson Road, Dayton 9, Ohio.

Instruction:

PORT ARTHUR COLLEGE. Port Arthur, Texas, provides training in radio, radar & television necessary to pass FCC exams for phone and tel. licenses. 12-14 months. Start any level, low tuition with board & room at cost in dorm. Advanced students on-the-job KPAC (500-watt station) training. Approved for Veterans. Write "Registrar" for catalog and info. New courses start every 5 weeks.

For Sale:

BC457-A with complete power supply, 80 watts, \$35. WØRNV, Route 3, Brainerd, Minn.

SELL: 21A midget teletype tape printer \$45. 12,000-ohm 110 v.d.c. relays DPDT \$1.75. Collins 32V-1 \$375. 32V-3 \$595. Boehme keyer and tape perforator, \$145. Dumont #241 scope \$275. WANT: SIG-5 supply catalogs, technical manuals, ARN-7, APR-4 tuning units, ART-13 and parts, CU-25, BC610, BC614, BC989. Will trade. Tom Howard, W1AFN, 46 Mt. Vernon St., Boston 8, Mass. Richmond 2-0916.

SELL: Millen 90902 oscilloscope less 2BPI \$25, 2 Selsyns 115v 60c 3 1/2" D x 5 1/2" L \$12, Bliley CC02A \$7. Used tubes 3-812A and 4-812 \$12, Hammarlund frequency standard FS-135 \$6, UTC S-9 transformer \$3.50, Triplett 2 1/2" 300 ma. meter \$3.50. FOB, W3NQA, 201 Pioneer Street, Warren, Pennsylvania.

DUMONT 208 5" scope \$125. BC221 T in Bud cabinet \$50, Millen 90800 50-watt transmitter \$20, Simpson Model 380 wavemeter modulation indicator \$30, new Amprobe Jr. 25 \$15, Silver Micro match 908 \$25, or will trade for 10" or 12" bench or table saw. Levern Glau, Route One, Sioux City, Iowa.

NEW SX88, best offer. New HT20, best offer. Postwar SX28A, like new, \$145. Bob Denniston, Box 709 Newton, Iowa.

FOR SALE: Complete mobile station—Elmac A-54 xmtr; Elmac PMR6-A rcvr; dynamotor; whip antenna; 75-meter loading coil; all for \$200. VHF152A, like new, \$39. Novice CW rig, complete with 80-meter coil, xtals, tubes, power supply, \$18. Cabinet, 22" x 48", black-crackle finish \$3. W6RZJ, Dulce, New Mexico.

75A3 NFM and matching speaker \$485. SX71 \$165. Eldico GDO \$20. Ten meter xmtr with 6 v.d.c. dynamotor and relays \$30. W8ZBD, 511 N. Warner, Bay City, Michigan.

FREE. BIGGEST list of Ham gear in the country. AM, SSB, RTTY, Mobile, etc. Write for your copy today. Dossett, 855 Burlington, Frankfort, Indiana.

RTTY Polar Relays, WE255A, brand new, boxed \$8.50; Keyboard, very clean, converted per CQ Sept.-Oct. 1954, needs inexpensive matrix only \$7; exc. condition Harvey-Wells TBS50A \$70; reconditioned Teletypewriter \$50; G.I. disc recorder & playback like new \$15; 12GP7 new \$8. Andrew Stavros, W2AKE, 116-32 132 St., South Ozone Park, N.Y.

BC929-A scope, tubes, excellent \$20. f2.0 125mm Schnieder Xenon lens, 4x5 Graphic Mount \$40. 2 Foto-later dark-room ventilators \$20 each. WANT: KW 813 final with coils for all bands, rack mounting. W4VDF, Indian Rocks, Florida.

REAL BARGAINS: New and reconditioned Elmac, Gonset, Morrow, Collins, Johnson, Hammarlund, National, Hallicrafters, RME, Millen, Lyco, others. Reconditioned S-38 \$29; S-40A \$69; S-76 \$129; SX-71 \$169; SX-42 \$179; SX-62 \$179; SW-54 \$29; NC-57 \$59; HFS \$79; NC-125 \$129; NC-183 \$199; HQ129-X \$169; Harvey-Wells TBS50C \$69; Meissner EX \$49; S-40B, HT-20, Collins 75A-1, 75A-2, 75A-3, 32V-2, 32V-3, Viking I, Viking II, Viking VFO, many others. Shipped on approval. Easy terms. Satisfaction guaranteed. Write for free list. Henry Radio, Butler, Missouri.

FOR SALE: Harvey-Wells TBS50D \$75. Matching power supply \$25. 522 xmtr and rcvr, now in use \$40. W2LOB, 108 Sunset Ave., North Arlington, New Jersey.

ODDS 'N ENDS: Dynamotors: in 12v. out 330v., in 12v. out 500v., in 12v. out 275v. and 550v., also some 24v. at various outputs. Transmitters: ARC-5 (5.7-7.0 Mc.) for 40 meters, ARC-4 for 2 meters. New tubes: 50-466A, pair 304TL, 2-5" cathode ray. Transformers: Power, Pri. 115v.—Sec. 800v. c.t. @ 300 mls, 5v. @ 6 amp. 6.3v. @ 5.5 amp.; Power, Pri. 6v. or 115v.—Sec. 6.3v., 150v. and 400v. Power, Pri. 115v.—Sec. 700 v.c.t. @ 350 mls, 2.5v. @ 10 amp., 5v. @ 5 amp. Plate, Pri. 115v.—Sec. 1600 v.c.t. @ 100 mls. Make an offer to buy or trade. Will answer all. Dan Johnston, W2CMI, Viewmont Terrace, Little Falls, N.J.

VHF152A Converter A-1 condition \$35. Gonset communicator I, latest model \$150. Mercury 5 HP motor 1954 model, brand new, \$155. Gonset VFO preamplifier for use with Gonset communicator \$55. Converted BC522 transmitter w/ power supply, panel mounted, ready to go on air, \$45. E&F coils for HRO50TL @ \$14 each. Bill Harper, W9BWM, 4037 Eddy Street, Chicago 41, Ill.

FOR SALE: Morrow 3BR \$20; Babcock DX transmitter \$45; Elmac VVC 60-20 \$35; BC312 receiver \$40; Carter dynamotor 6v.—420v. 280 mls \$35; ten-meter coils for BC779 \$15.00. W5ZLW, 2807 North 24th, Lawton, Okla.

YOUR BID? All Viking—all like new—II, VFO, Match Box, Signal Sentry, HRO50T with XCU, NBFM, speaker, AA, A, B, C, D, coils—RME DB23. W9CVF, Greenwood, Indiana.

SELL: National HRO5TA1 receiver complete coils, tubes, speaker, power supply; VHF152A, new used; DB22A six months old, perfect. W2JIL, Box 62, Brooklyn 12, N.Y.

BARGAINS: With New Guarantee: R9-er \$15; Gonset Triband \$27.50; VHF-152A \$39.50; S-72 \$59.50; S-40 \$65; NC-57 \$65; RME-45 \$99; Lyco \$89; S-27 \$99; SX-43 \$129; S-76 \$149; SX-71 \$169; SX-42 \$189; HRO-50 \$275; HT-17 \$32.50; EX Shifter \$49; Globe Trotter \$49.50; Harvey-Wells Sr. \$69; DeLuxe \$89; Viking I \$209.50; New SS-75 \$189; HT-9 \$159; Globe King \$295; 32V1 \$395; 32V2 \$475; 32V3 \$595. 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: NC-57 with "S" meter. Hallicrafters HT-6 with coils for all bands, ECO units for 20-meters and 75-meters, and instruction book with schematic. Both very good condition. Will sell separately or together. Best offer takes. Dale Rockwell, WØUVZ, Arlington, Neb.

MOBILES! Compact Volt-Ohm-Milliammeter Multi-Tester. Ideal for glove compartment or workbench. Ranges: Volts a.c. and d.c. 0/15/150/750; current 0/150 milli-ampers; resistance 0/100,000 ohms. Rugged bakelite case. Test leads included. \$11.95 postpaid. Photo and data on request. Immediate shipment. United Instrument Company, P.O. Box 242, San Francisco, California.

FOR SALE: Three Elmac 4-125A tubes, brand new, in original factory cartons. Will sell individually or all three. \$25. each shipping prepaid in U.S.A. Harold Reed, W3EJP, 1347 South Capitol St., Washington 3, D.C.

MOBILE: Elmac A54 transmitter, Leece Neville alternator complete with regulator, rectifier and xmfr, Gonset Super Six and Motorola police cruiser receiver, PE103 dynamotor. Best offer over \$200. All inquiries answered Frank Schwartz, W4KFK, 204 6th Ave. No., Nashville 3, Tennessee.

SELL: RME 2-11 VHF 11/10-6-2 meter 14-tube double conversion receiver with "Piggy-Back" r-f stage on 144 (June 1953, CQ). First \$75 takes. Box RC, c/o CQ Magazine.

BUY SURPLUS radio equipment from U.S. Government List \$1.00. Details 10c Ham Box 213, East Hartford, Conn.

GELOSO VFO units used in W6SAI article, October CQ now being imported at \$35.00, tested and calibrated without tubes. GILFER Associates, Box 239, Grand Central Station, New York 17, N.Y.

10, 15 & 20 METER BEAMS, aluminum tubing, etc. Perforated aluminum sheet for shielding. Radcliff's Fostoria, Ohio.

FOR SALE, several sets of ART-13 150-watt modulation and driver transformers, also fully cased power transformers and 10 hy filter choke for speech amp. Power transformer has hv for speech amp, also 90 v.d.c. a. 200 mls for bias, two 6.3 v.a.c. windings, two 5 v.a.c. windings for rect. and modulator filaments. Primary tapped for 100-110 v.a.c. Power trans. and choke art. UTC. All transformers are brand new and clean. Included is schematic for speech amp and dope sheets on transformers and impedance chart for mod. tubes. Price for complete set is \$15.50 postage paid. Send MO or certified check to Jim Daily, W4PLC, Box 13, Mocksville N.C. WANTED: 3-Western Electric 728-B 12" speakers will swap new paid Elmac 100THs for one, or two sets of above-mentioned transformer deal for one.

COLLINS 30K-1. Like new condition. Used less than 50 hrs. \$950. FOB. New York City. Box HC c/o CQ Magazine.

BC459-A in very good condition, like new, \$15. 4-element wide-spaced 10M beam \$20. Harold Denny, R4, Washington, Indiana.

Trading Corner:

TRADE 522 transmitter and receiver with power supplies rack mounted, push-to-talk, mike, spare 832, for HI-FM or AM-FM tuner. W2DTE, Robert Coughan, 29-2 213th Street, Bayside, New York.

FOR SALE OR TRADE: two-4-250A's, three-4-125A's, several dynamotors 6 v.d.c. 420v. @ 280 Ma. output \$1 each or will swap. Write W9IGH, Arnold Hatfield, 20 East Lowell Ave., Mishawaka, Wisconsin.

mastering it should be made to operate on a frequency by himself. I know some other fellows who agree with me. I am 16 years old and a Junior in high school." Bill Butler, KN2IYO, writes, "My license came today on my birthday (I am 15). I was so nervous when I saw the envelope with Federal Communications Commission on it that I had to bring it in the house and have someone else open it for me." (I also think Bill was still a bit excited when he wrote the letter. It was dated August 4, 1955!).

Burt Gandy, KN2HCF, writes: "I have been on 40 meters a lot lately and now have 29 states confirmed. I am using an end-fed 125-foot wire on both 80 and 40 with fair results. Also have a vertical on 40. I worked California the first night I had the vertical up. It also works well into Texas. . . . Have had about seven contacts on 15 meters, including a VE1 and a KN6. The KN6 was worked at 3:00 p.m. on a 22-foot piece of wire strung in the attic. . . . I am 34 years old. I am really enjoying Ham radio, QRM, QSB, and QRN included. I had two years of code in the Navy; so no trouble copying, but would like to improve my sending. Also hope to get started on the General theory very soon."

Help Wanted

Roy H. Engfield (21), 758 Hall St., Sarnia 10, Ontario, Canada.

Ralph Parker (16), 1167 Lorette Ave., Winnipeg 9, Manitoba, Canada. Telephone: 444370.

Ken Milburn (17), 484 Ingersoll St., Winnipeg, Manitoba, Canada. Telephone: 723429.

Charles W. Parsons, Greenup, Kentucky.

Mark Marshall (14), Box 109, Fort Amador, Canal Zone. Phone 2380. (His old address appeared in August listing).

Robert Reisenweber (16), 135 West 25 St., Erie, Pa. Telephone: 28-4316.

Howard Buswell (15), 6155 Barnett Valley Road, Sebastapol, Calif. (Aiming for a General Class license).

Stephen Sorton (13), Garden Drive, New Windsor, N. Y. Newburgh 49996-M.

Billy Howard (15), P.O. Box 8556, 2880 Cela Road, Raleigh, Tenn. Phone: Memphis 4-9826.

Samuel Birken, 1050 Wheeler Ave., New York 2, N.Y. Phone: TL-29084.

Pvt. Donald E. Simonsen (22), Hqs. Co., 2 Bn., 85 Inf. Reg't, 10 Inf Div, Ft. Riley, Kansas.

Each month CQ lists those names and addresses of prospective Novices and Hams needing assistance with code or theory. To have your name listed, please address your request to Herb Brier, W9EGQ, 385 Johnson Street, Gary 3, Ind.

Wesley R. John, KN2HUW, 523 First St., Palisades Park, N. J., suggests: "New Hams, of which I am one, may find as I did that an atlas containing listings of all towns and cities in the U.S.A. is very helpful. When one fails to copy a QTH completely, a quick check in the atlas under the proper state and you can generally figure out what town you were working."

Miss Bertie Hill (18), Rebecca Sealy Nurses' Residence, 15 Avenue C. Galveston, Texas, reports: "I have been interested in amateur radio for two years, but I still haven't made the grade. My brother, Don, WN5CSM, caught the bug from me and did make the grade. He runs 40 watts to a long wire, and his receiver is an -38C. . . . I am a Sophomore at the Medical Branch of degree in nursing. I'd like to exchange letters with anyone who would like a YL 'pen pal' who is a prospective He University of Texas, where I am studying for a B.S. master."

Robert "Speed" Hardie, WN5EUQ, 2216 Bluff St., Ft. Smith, Ark., wrote me two letters. In the first he said: "I run six watts on 40 meters and have worked 32 states. But there is a shield around the United States? I can't get out of it, but some DX gets in. I have heard KH6, WP4, OH2, OZ2, CO2. . . ." In his next letter, Speed onchalantly mentions working three WH6's (Hawaii), WP4 (Puerto Rico) and raising Mexico. In addition, he now has 37 states. But he must have gone "High power," because he mentions his AT-1 transmitter. His 8-foot vertical antenna may help too. No more space. See you all next month. 73, Herb.

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ARC-4 VHF TRANSCEIVER

This makes a perfect 2 meter CD or CAP. Complete with our simple schematic and all tubes. \$24.50
Brand new, less dynamotor and crystals. . .

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GENERATOR

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24-VOLT GENERATOR, brand new . . . \$9.95

METER BARGAINS! (All removed from new equipment) 0-4 AMPS or GE 3" round enclosed in aluminum case. For Xmt. output readings. . . . \$3.95
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6-0-60 MICRO AMPS, Western Electric. . . . \$4.95
WESTON FREQ. METER, new. . . . \$14.95

COMMAND EQUIPMENT

Q5/RS. 190-550 KC Excellent condition, just like new. Check this price. . . . \$9.95
R-21/ARC-5, 5.3-7 Xmt. . . . 6.95
R-27/ARC-5, 6-9.1 MC Receiver. . . . 6.95
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TN-65/APQ-15 Makes a beautiful 2-METER XMTR. Unit tunes right into "2." Little rewiring and adding modulation. Push-pull 6C4's oscillator driving 832 in parallel. MO tuning from front panel. Fits glove compartment under dash. With 6J6, 2 6C4's, less 832. Includes Schematics, conversion sheet. Special. . . . \$7.95

24 VOLT TRANSFORMER & RECTIFIER COMBINATION

A basic 24 V. DC power supply consisting of 110 V. AC primary, 24 V. secondary, and a Rectox Rectifier. Normally rated at 1 amp but operates intermittently up to 3 or 4 amps. Worth at least \$2.95
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COAX SPECIALS!

FT & T COAX. CABLE RG-8/U 110 ft. roll with PL-259 connectors at each end. Individually boxed and branded. Hurry. . . . \$5.25
51.5 OHM COAX. CABLE similar to above. 500' roll. . . . \$24.95 100' roll. . . . \$4.50
RG-34/U 71 OHM COAX. .625 dia. 5 KW rating 85-ft. rolls with PL-173 plug at one end. . . . 7.95
SO-153 CHASSIS PLUG to match PL-173. 98
RG-59 COAX. 25-ft. length with PL-259A at each end. . . . 1.95

EXCITOR UNIT FOR WILCOX XMTR. Contains all relays, transformer, sockets, tube lineup (tubes not included) 1852, 1852, 807, 813, 6SN7, \$9.95
6J5, 811, Used, xmt. cond. Shp. wt. 30-lbs.
WESTINGHOUSE INVERTER CAPACITOR for DC welding, single side band, power supplies and other industrial uses. 120 mfd @ 3000 V. \$69.50
Model 1313852

BRAND NEW APS-13's complete with tubes, dynamotor and all parts. \$19.95
In original condition. . . .

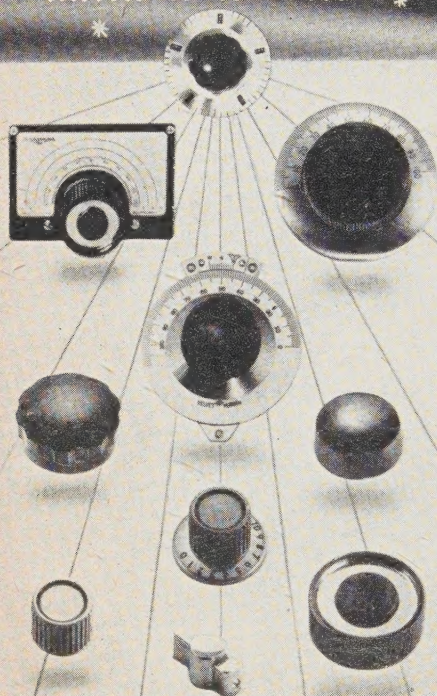
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NATIONAL knobs—distinguished by their clean, functional, chrome and plastic styling and sturdy construction—are the most popular of their type ever produced. All fit 1/4" shafts. For commercial applications, they can be supplied in special colors and with special calibrations.

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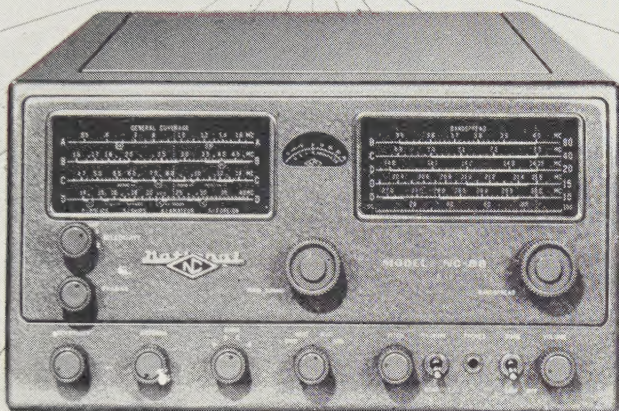
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**THE QUALITY
LINE IN
MOBILE
ANTENNAS**

VAARO ELECTRONIC ENGR. CO.
BOX 5035, LONG BEACH, CALIF.

hottest value in ham radio



The New NC-98

\$149⁹⁵

Feature for feature, dollar for dollar, nothing on the market even comes close to the new NC-98! Compare and prove it! Complete with crystal filter and an S-meter at this modest price. No other offers this, plus these additional performance features:

550 kcs to 40 mcs range • calibrated amateur bandspread (or SWL bandspread for short-wave listening) • new miniature tubes • an RF stage • two IF stages • edge-lighted dial scales • noise limiter • separate high-frequency oscillator • 3-position selectivity • antenna trimmer • phasing control • sensitivity control • accessory socket •

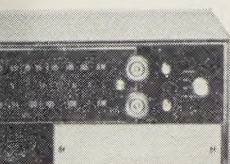
tuned to tomorrow

National



the new **HORIZON** *in high fidelity*

Whether you're a hi-fi fan or not, you'll be called on as an expert to voice an opinion. We sincerely feel we have the finest line on the market and we'd like your recommendation. Won't you please write for complete specifications?





HIGH POWER

costs less ...

with **RCA** tubes

Highly regarded by radio amateurs for their high power output at moderate plate voltages, RCA-designed power types are the answer to real transmitter economy when you plan to raise your output. Here's how these types reduce transmitter construction costs:

1. They do not require very-high-voltage plate supply transformers.
2. They reduce the need for extra high-voltage rating rf bypass and dc filter capacitors.
3. They minimize the need for heavy-duty, wide-spaced tuning capacitors.
4. They reduce rf and dc insulation problems —all the way through.

Check table for the power you want and see how little plate voltage it takes to get it. Your local RCA Tube Distributor can supply you with a complete line of RCA tubes for amateur use. Get technical bulletin(s) from RCA, Commercial Engineering, Section H 15M, Harrison, N. J.

Typical Power Input and Plate-Voltage Values for popular Class C Telephony			
RCA No.	Type	DC Power Input (watts)	DC Plate Volts
110	High-perveance triode	500	2000
111A	High-perveance triode (High Mu)	520*	1500
112A	High-perveance triode (Low Mu)	520*	1500
113	Beam Power	500	2250
33A	High-perveance triode	1000	2250
000	High-perveance triode	500	2000
005	High-perveance triode	600*	1500



RADIO CORPORATION of AMERICA
ELECTRON TUBES
HARRISON, N. J.

*For two tubes