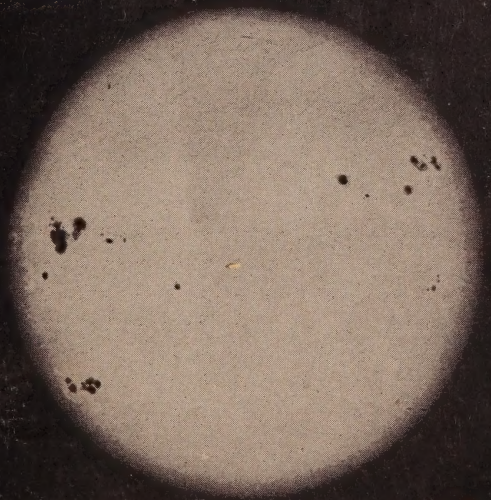
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CQ RADIO AMATEURS' JOURNAL

JULY 1953

In This Issue: A Report On —

DX and the SUN



35c



20 METERS, Type Z-3, $3.95 • 40, 80 AND 160 METERS, Type Z-2, $2.95

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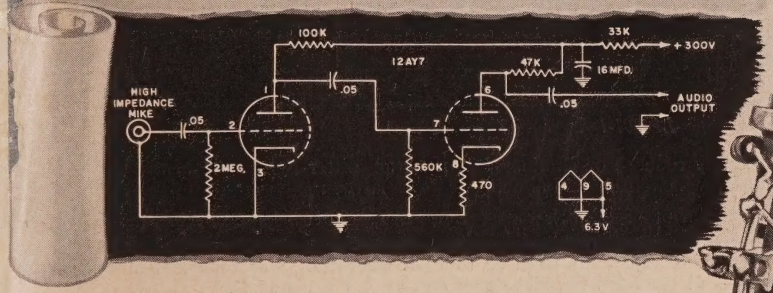
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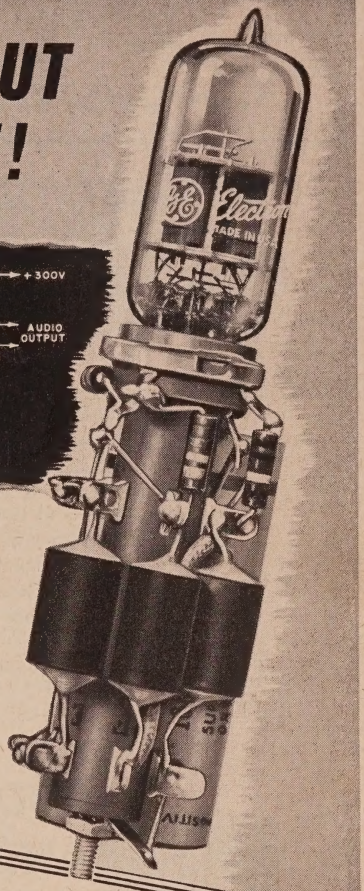
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EXPORT SALES ONLY: Royal National Company, Inc., 75 West Street, New York 6, N. Y., U. S. A.

BOOST SPEECH INPUT WITH G.E.'s 12AY7!





This 2-stage amplifier takes up only 1 square inch chassis space!

Here are tube and circuit to help toward that clear, crisp voice transmission you've been seeking. The amplifier is simple to build . . . so small it won't crowd your chassis . . . and what a lift it gives mike-to-transmitter input!

Another good point about this "package" amplifier is the low noise level of the 12AY7. G.E.'s twin triode was specially designed to keep down hiss, hum, and microphonics. Your words suffer a minimum of distortion from audio by-products.

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1953 EDISON AMATEUR AWARD!

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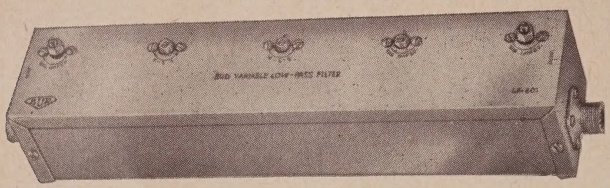
● In September, G. E. will announce terms of the 1953 Edison Award for outstanding public service by a radio amateur. Presentation of the Award means acclaim not only for the winner, but for all radio amateurs and their important contribution to safety and welfare. Your support will help establish this national recognition. Get ready now to name the amateur you believe best qualified for the Award!

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166-187

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Also available in earphone model CPO-130 at $13.20 Amateur Net

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VOL. 9, NO. 7
JULY, 1953

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Our cover photograph was taken of the face of the sun during an unusual sunspot display which occurred on March 6, 1947. This is an official U. S. Navy photograph.

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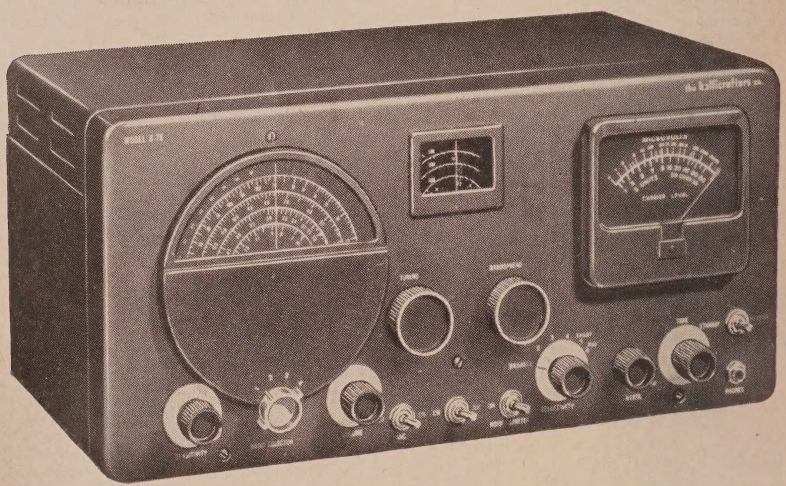
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★ Dual Conversion — no images!

★ Automatic Noise Limiter!

★ Giant "S" Meter — 4" Scale!

★ Temperature Compensation!



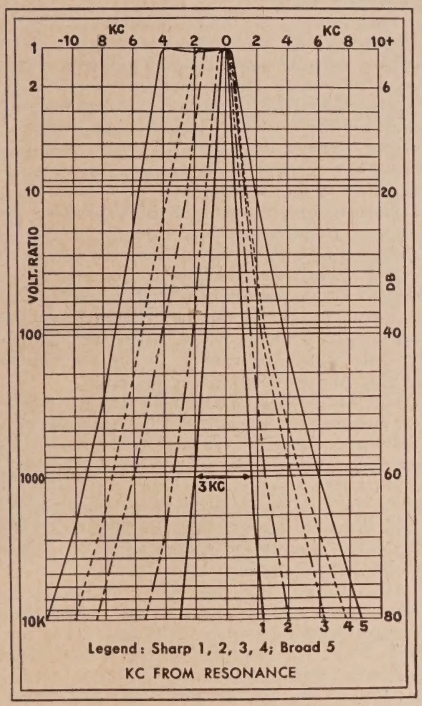
The medium priced receiver that made the industry adjust its sights! Unmatched selectivity, even from receivers that cost twice as much. Just check the selectivity curves against other sets — see what Hallicrafters unmatched design experience can mean to you.

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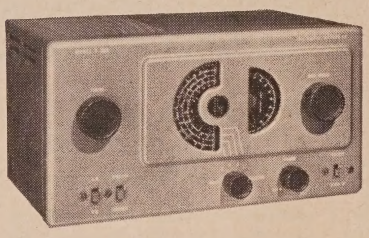
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TVI Suppressed 100 Watter—Model HT-20—Continuous coverage from 1.7 mc to 31 mc. Full band switching. Choice of 10 crystals. Shielded, filtered r-f compartment plus built-in, low-pass 52 (ohm) coaxial line output filter reduces to more than 90 d.b. all responses over 40 mc.
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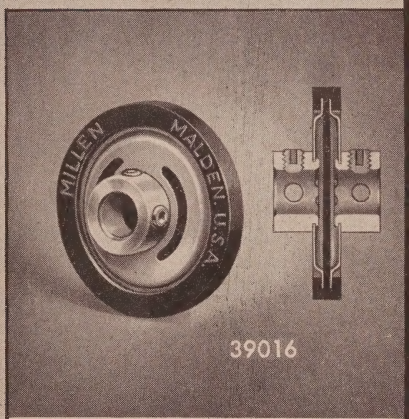
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Feenix, Ariz.

Deer Hon. Ed:

Last Sunnay are kinda wandering around shack, wondering like heck what can doing, and finely deciding that are good time to up with putting sum good skywires. Every amchoor needing good antennas. Listening to those California Kilowhats. Are they getting out just becaws they having all that sooper power? No indeedy. Those smart gentlefellows having reel red-hots antennas. So, Scratchi deciding to go do likewise.

Howsumever, the more I thinking about same, the more I deciding that are doing no good to just stringing up long hunks of wire. By gollies, you having to toon them. Hokendoke, I can using a grid-dip meter. That way can telling when antennas are resonant. Hah! At this point Scratchi reelizing that not having grid-dip meter. Are just abouts to give up hole idea when coming to and remembering that buying kit for same sum years ago.

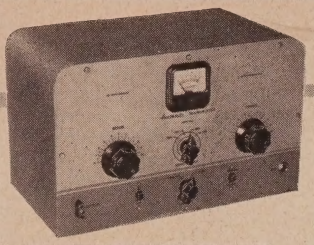
One half-hour and a pair of ripped pants later are cuming across kit eggzakly where putting it sum years ago—in cellar. After blowing dust off box and scraping spider webs off I opening it and finding even having skeematic diagram. Ah so! Things are about to hum. Getting piece of wood and scraping junk from workbench into cardboard carton so having space to work, laying out skeematic diagram and getting all parts sorted.

Hon. Color Code not being on any resistors, so using homemeter to figuring out value. Hah! they thought they fooling Scratchi by leeving color code off! Next, are mounting parts in case, plugging in soddering iron after locating extension cord, and are set to go. Whoops, not quite. No sodder in kit. No sodder on workbench. No sodder nowhere. But will that stop Scratchi? Not by a jugfull. No sirree. Scratchi are ball of fire today. Can't thinking of any amchoor who willing to lend Scratchi any sodder, so, I'll making it myself.

Quick trip to Hon. Brother Itchi's fishing tackle box are producing lots of lead sinkers. Trash can giving up several old tin cans. Now, let's see? What are in sodder besides tin and lead? Maybe can using sum bismuth. Having sum in medicine cabinet. Also finding other old jars of stuff, so getting those to. Dumping hole mess into pot and putting on stove.

While sodder are heeting, I finding sum nice big spaghetti, like kind using in radio, not like kind eating, and also making sum funnels out of tin can. Pretty soon sodder are nice and flewid. Being very carefool, I pooring sodder into spaghetti. Filling

(Continued on page 8)



Heathkit AMATEUR TRANSMITTER KIT

Range	80-40-20-15-11-10 meters
6AG7	Oscillator - Multiplier
6L6	Amplifier - Doubler
5U4G	Rectifier
105-125 volts AC 50/60 cycles 100 watts	
Size — 8½" high x 13½" wide x 7" deep	

MODEL AT-1

$29.50

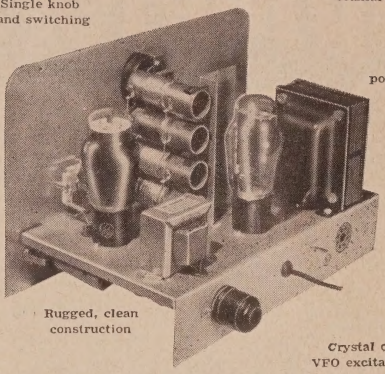
SHIPPING WT. 16 LBS.

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Single knob band switching

52 ohm coaxial output

Built-in power supply



Rugged, clean construction

Crystal or VFO excitation

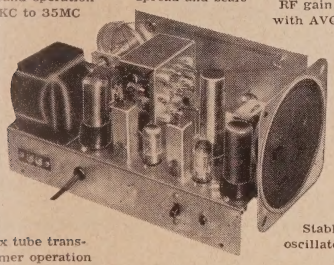
Here is the latest Heathkit addition to the Ham Radio field, the AT-1 Transmitter Kit incorporating many desirable design features at the lowest possible dollar-per-watts price. Panel mounted crystal socket, standby switch, key click filter, AC line filtering, good shielding, etc. VFO or crystal excitation-up to 35 watts input. Built-in power supply provides 425V @ 100MA. Amazingly low kit price includes all circuit components, tubes, cabinet, punched chassis and detailed construction manual. (Crystal not supplied.)

New HEATHKIT COMMUNICATIONS RECEIVER KIT

Four band operation 535KC to 35MC

Electrical band spread and scale

RF gain control with AVC or MVC



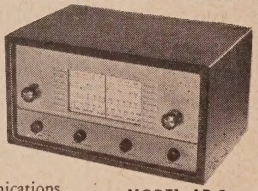
Six tube transformer operation

Noise limiter — standby switch

Stable BFO oscillator circuit

5½" PM speaker — headphone jack

Range	535KC to 35MC
12BE6	Mixer oscillator
12BA6	IF amplifier
12AV6	Detector - AVC - Audio
12BA6	BFO oscillator
12A6	Beam power output
5Y3GT	Rectifier
105-125 volts AC 50/60 cycles 45 watts	



A *new* Heathkit AR-2 Communications Receiver. The ideal companion piece for the AT-1 Transmitter. Electrical band spread 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.

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$25.50

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CABINET

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THE IMPROVED Heathkit GRID DIP METER KIT

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- Range — 2MC to 250MC
- Meter sensitivity control
- Compact one hand operation
- Headphone monitoring jack
- Transformer operated

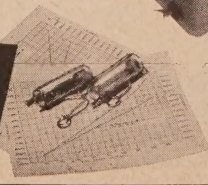
The invaluable instrument for all Hams. Numerous applications such as pre-tuning, neutralization, locating parasitics, correcting TVI, etc. Receiver applications include measuring C, L, and Q of components, determining RF circuit resonant frequencies, etc. Thumbwheel drive for convenient one hand operation. All plug-in coils are wound and calibrated (rack included). Headphone panel jack further extends usefulness to operation as an oscillating detector.



MODEL GD-1A

$19.50

SHIP. WT. 4 LBS.



Two additional plug-in coils are available and provide continuous extension of low frequency coverage down to 355KC. Dial correlation curves included. Shipping Wt. 1 lb. Kit 341. **$3.00**

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Dip Meter



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★ Monitoring Jack and Diode Switch
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See it at all leading electronic parts distributors throughout the U. S. A. and Canada; or write for descriptive bulletin.

BARKER & WILLIAMSON, INC.
237 Fairfield Avenue • Upper Darby, Pa.

(from page 6)

about ten lengths before running out of sodder. Are noticing funny smell in kitchen, cuming from smoldering spaghetti. Taking hole mess and dumping water on it. There! Sodder! Even having protective covering around it—scorched spaghetti!

Going back to workbench, putting soddering iron on connection, applying sodder, and . . . Hon. Ed? How can you thinking such a thing! Are it working? Well, of natchurally. Sodder are flowing so smooth and easy, and hardening up like rock of granite. You are thinking that Scratchi are stoopid? How hard is it to making sodder. Hah!!

Not taking long before are having grid-dip meter finished. Putting in toob, connecting to AC line, turning on switch. Hokendoke! Toob are liting up like kilowhat final. It are lucky I having another toob. It also are lucky I not stoopid, as checking wiring before putting new toob in. Finding trubble reel quick-like. Seeming that I wiring toob socket for being rightside up when ackyoually are being rightside down.

Plugging in soddering iron, starting to unsodder socket connections. Iron not hot, sodder not melting. Waiting few more minutes. Iron still not melting sodder. Wiring in auto-transformer and putting 220 volts on iron. Now it are hot, by gollies. Putting it on connection. Hokendoke Hackensaki!! Hon. Ed., sodder not melting! Trying trusty pair of side cutters on sodder. Anybuddies needing nicked pair of side-cutters?

Oh my akeing back. What a 1/c predickament. Here are having a very fine grid-dip meter with socket wired backwards, and can't even unsoddering same.

What you thinking, Hon. Ed? Can you reckomending sum toob manufacturer who willing to make me a speshul toob, with pin 1 where pin 7 should be, and so ons? Rushing answer posty hasty, as wanting to getting antennas up before winter.

Respectively yours,
Hashafisti Scratchi

JULY 26th BASKET PICNIC AT CLEVELAND, OHIO

The Cleveland Area Council of Amateur Radio Clubs has announced their Basket Picnic for Amateurs and their families, which they have scheduled for Sunday, July 26, from 1300 until dark. It will be held in a reserved section of Roundup Lake Park, on Route 82, about 30 miles ESE of downtown Cleveland near Mantua Center. There will be prizes for the Amateur, the XYL, and the Kids, plus the usual run of games during the mid-afternoon. The gang will also have use of the park facilities, which include swimming, boating, and the children's play area, in addition to the use of concessions, and arrangements for dancing in the evening. A ten-meter fixed station will also be located in the park. Registration will be $1.00 per person, and prizes will be awarded only to registrants. A complete family may be admitted under a single registration, or the amateur may want to register his family as individuals, in order to acquire eligibilit for the prize drawings. Everyone is invited to com and meet the gang.

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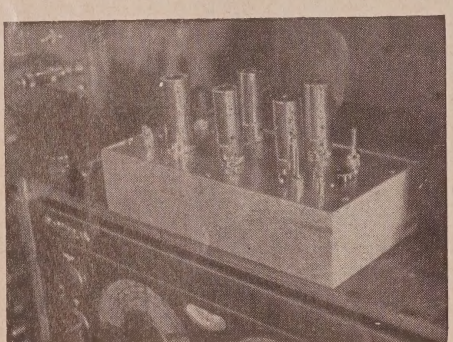
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PROVIDES:

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Present and Prophetic

Terre Haute, Ind.

The Annual Turkey Run VHF Picnic will be held during July nineteenth at Turkey Run State Park, Indiana, 35 miles north of Terre Haute. Ed Tilton, VHF Editor of QST will be present. There will be a buffet style lunch. For further particulars, write Charles Hoffman, W9ZHL, Box 186, North Terre Haute, Ind.

Waterton, Mont.

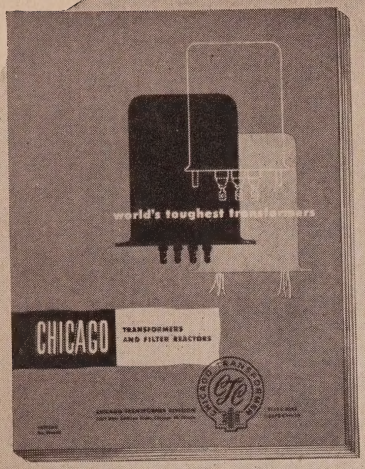
The annual Waterton-Glacier Park International Hamfest will be held at Two Medicine Lake in Glacier Park on July eighteenth and nineteenth. For further information contact W7BNU or W7AFM at Whitefish, Montana.

Augusta, Ga.

The combined August and Camp Gordon Hamfest will be held on Saturday and Sunday, July 25th and 26th. Sponsored jointly by the two clubs (The Augusta Amateur Radio Club and the Camp Gordon Radio Club), this meeting is expected to be one of the biggest get-togethers of Hams in the Southeast. The main program will take place at the Julian Smith Casino on Lake Olmstead at the western edge of Augusta, and will include a barbecue dinner and beverages, commencing at 1000 on Sunday, July 26th. A Viking II transmitter will be given away as the door prize, and an Elmac A54 Mobile Rig will be raffled off as an additional prize. Prizes and activities for the XYL's and children will be part of the agenda. It is suggested that all Hams should clean out their shacks before attending, to be ready to swap and swindle. You may buy your tickets ($3.00 for adults and $2.00 for children) from F. A. Saxon, W4AAY, Hamfest Chairman, 2329 Laurel Lane, Augusta, Ga., and at Station K4WAR, Camp Gordon, Ga. Late charges of fifty cents per ticket will be made if tickets are purchased after July first. Here's an additional treat—On Saturday, July 25th, from about six p.m. until the wee hours, there will be an informal gathering at the Dutch Motel on U. S. Highway #1, about five miles south of Augusta. This pre-Hamfest meeting is expected to be a great success, with the entire air-conditioned facilities of the motor court at the disposal of nothing but Hams for the week-end. Out-of-town Hams desiring reservations may contact F. A. Saxon, W4AAY, at the above address.

Pittsburgh, Pa.

Pittsburgh's fifteenth annual Hamfest, sponsored by the South Hills Brass Pounders and Modulators, will be held on Sunday afternoon, August second, at spreading Oak Grove and Totem Pole Lodge, South Park, in Pittsburgh. Scheduled to last from noon until dark, the party will include a hot lunch, which will be available on the grounds at nominal cost, and a prize drawing, which will feature as first prize: A choice of a Johnson Viking II transmitter kit, a Whirlpool Automatic dryer or SX-71 receiver. Entertainment has been planned for the YL's, XYL's and Harmonics, so, rain or shine, come out and meet the gang. Bring the family and/or your best girl. Registration: $2.00.



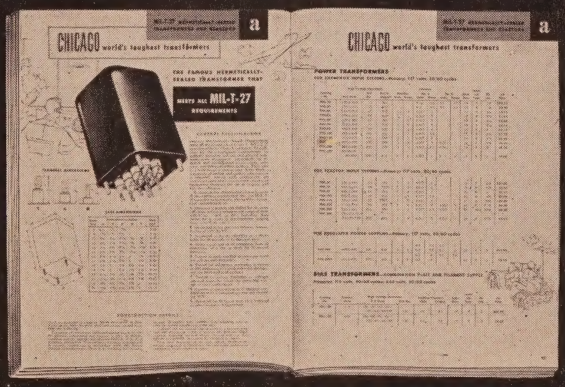
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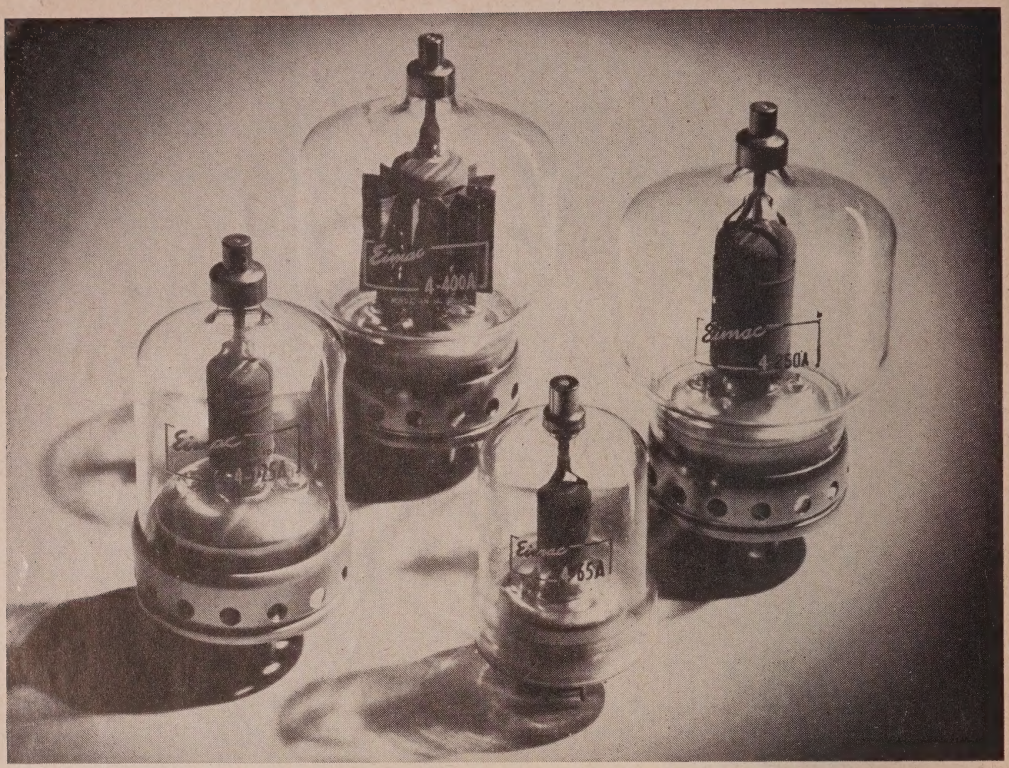
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World-Wide DX Contest

The following times and dates have been set up for the next *World-Wide DX Contest*. The first contest weekend will start on October 24th at 0200 hours GMT. This first contest weekend will end on October 26th at the 0200 hours GMT. The second contest weekend will start on October 31st at 0200 hours GMT and will end at 0200 on November 2nd.

The *World-Wide DX Contest* this year will not be sponsored by *CQ Magazine*. Although the Contest will be definitely held and the rules and results announced in *CQ*, a separate sponsoring organization will be established in order to handle operating details of the Contest. A discussion of the new sponsoring arrangement is scheduled to take plate at the Houston National ARRL Convention. A report of the new arrangement will be carried in an early issue of *CQ*.

As indicated elsewhere in this issue, the 1951 contest certificates have been distributed. It is anticipated that within a few weeks after this magazine appears in print, distribution of the 1952 contest certificates will commence.

VHF Splatter

Our comments in the June Editorial on the apparent (at that time) lack of interest in the continuance of a VHF Department brought forth a veritable avalanche of protest. Much to everyone's surprise at this end, there appears to be a rebirth of interest in VHF activity. To a great extent, the VHF group works very quietly and without fanfare, but their wrath was aroused by the June Editorial and as a body they arose to protest the absence of the VHF Department.

Every effort is now being directed toward the re-establishment of a suitable VHF Department. There is every reason to believe that the VHF world has outgrown the "Joe works John" type of column. A large percentage of the letters received commenting on the VHF field contained specific suggestions as to the type of material they would like to see in *CQ Magazine*. All of these comments were greatly appreciated and most of them have been acknowledged with our thanks via mail.

Numerous comments were received on *Scratchi, DX, YL, Amateur Teletype* and the *Monitoring Post* Department. All of these will be taken into consideration during the planning of material to appear in our Fall and Winter issues. We were also somewhat surprised to receive a number of letters asking to see more humorous material such as the "The PU Expedition" and "IPOIO." Fortunately, we will be able to satisfy many of these readers with the immortal story of "Horace Came Back" or "It can happen to you, too." Then there is the description of fellow amateurs by one of the old timers in the game called, "The Rugged Ranks of Radio." You'll love it!

The Austrian Amateur Situation

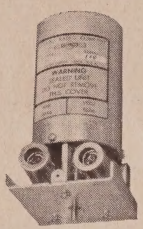
A recent memorandum presented to the IARU describing the plight of the Austrian Nationals is felt to be worthy of a few comments on this page. Many *CQ* readers are unaware, except by the prohibition on DX contacts established by the FCC, that Austrian amateur activity is entirely by "non-licensed" stations. The memorandum before the IARU brings to the attention of this international body the fact that Austria is still governed by the Four Powers. As a result, all regulatory authority must be unanimously approved. This has made it impossible for the Austrian amateurs to return to the air, although three of the governing powers hold no objections to legalized radio amateur activity. Stations now operating may be loosely called "pirates," although the nominal Austrian government would permit amateur activity were it empowered to do so. It is indeed hoped that this barrier will soon be removed.

o.p.f.

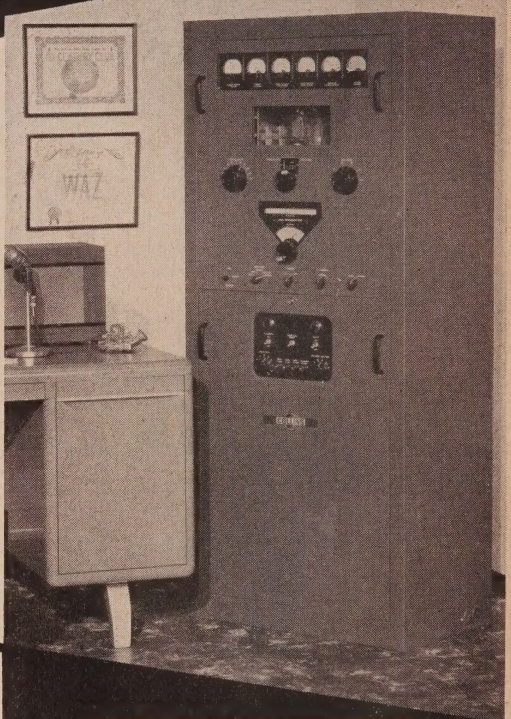
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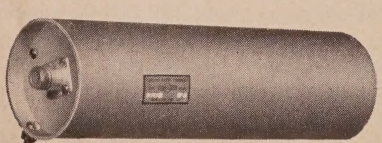


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DX and the SUN

GEORGE JACOBS, W2PAJ

Department Editor, CQ

Have you been wondering if DX conditions were actually as bad as they seemed? Have you been wondering how long they would continue on this downgrade? Have you been wondering what is in store for the DX man in 1954? In continuing its coverage of practical propagation CQ has commissioned W2PAJ to summarize the outlook for the next few years. It is presented in two parts. The first part is on what has happened, the second part will be on what will happen.
—Editor.

Part I of two parts. The second part containing predictions for the next two years will appear in the August issue.

One hears today among Amateurs much discussion, with considerable variance of opinions, about sunspots and their possible effects upon DX conditions during the next few years. The sun and its accompanying solar radiations are such an important factor in high-frequency radio communication that an up-to-date summary of the effects of the sun and sunspots on radio transmissions appears very much in order.

This article will discuss the role of the sun in making possible shortwave communications via the ionosphere. Past and present sunspot activity will be studied, with a discussion of the continued decline in present solar activity and its probable effects upon DX during the next few years.

The Ionosphere

Long distance radio transmission is possible only because of a region that exists in the upper atmosphere. This region is known as the *ionosphere.* It is the ionosphere that acts as a mirror reflecting high-frequency radio waves, generally between the range of 3 to 30 Mc., over great distances.

The higher regions of the earth's atmosphere are composed of various gases, mainly oxygen, nitrogen, hydrogen and helium. Ultra-violet radiation from the sun sweeping across this region causes these gases to break up into little bits of charged electricity, usually called *ions.* This phenomenon is termed *ionization,* and the ionosphere consists of these cloudlike layers formed by the "ionized gases." *Figure 1* shows these layers as they exist at various heights above the surface of the earth. During the daytime the lowest layer is the D-layer, followed by the E-layer, then the F1 and F2 layers in that ascending order. During the night or hours of darkness, when the sun is not present and ultra-violet radiation received by the ionosphere is at a minimum, all the layers with the exception of

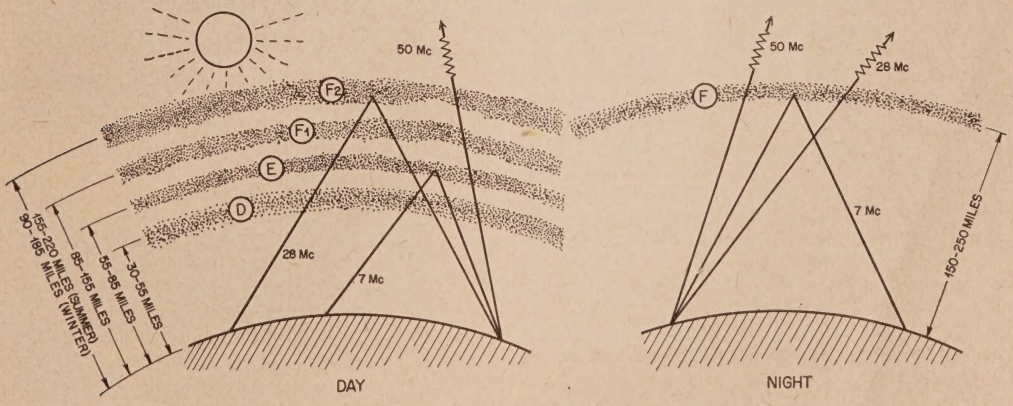
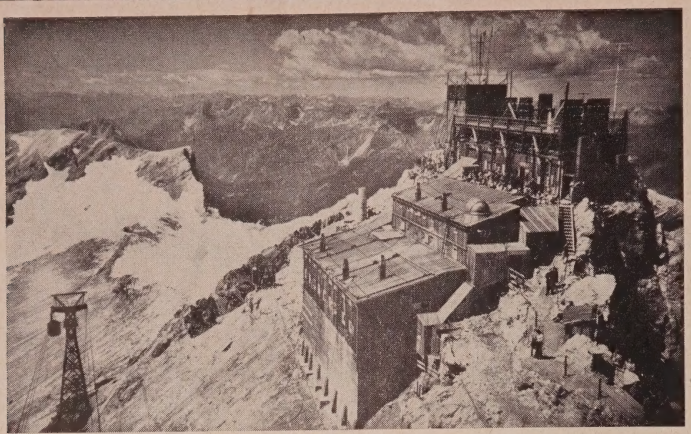


Fig. 1. The ionosphere consists of discrete "layers" that vary in height diurnally and seasonally. The height of the layer determines the "skipped distance" while the density controls the maximum usable frequency.



This is the Munich Solar Observatory, one of the number of such stations which help to plot ionospheric variations. The view here is from the Austrian Alps, looking toward Switzerland, at a height of 2,964 meters.

the F2 layer generally disappear. This night-time F2 layer is usually between heights of 150 to 250 miles above the earth.

Actually, when a radio wave reaches these layers, it will either be reflected back to earth or penetrate through and be lost in outer space, depending upon the frequency of the radio wave, the angle at which it strikes the ionosphere and the degree of ionization of the ionosphere itself. Strongly ionized layers will reflect higher frequencies than will weakly ionized layers. The degree of ionization being dependent upon the ultra-violet radiation received from the sun. As we know simply from observing seasonal weather changes, the sun's activity is anything but constant.

Daily and Seasonal Solar Variations

The position of the sun with respect to the earth's atmosphere, varies both daily and seasonally. The daily variations are due to the earth rotating about its axis every twenty-four hours. This changing position between a fixed point on the earth and the sun causes not only a variation in visible light from the sun (day-night), but also a corresponding variation in the ultra-violet intensity that reaches the ionosphere at that specific point above the earth. During the daylight hours, when ultra-violet radiations are strongest, the ionosphere is strongly ionized, and relatively high radio frequencies are reflected back to earth. During the hours of darkness, very little ultra-violet radiation reaches the ionosphere, and the region decreases to a single weakly ionized layer. If, during the night, we were to use the same high frequencies that we use during the day, we would find that the signal would penetrate completely through the weakly ionized layers and not be returned to earth. Therefore, at night, we must use a lower frequency which will be reflected back to earth by the weakly ionized night-time ionosphere.

Throughout the year the earth is traveling in a fixed path about the sun. It is this celestial journey that accounts for the various seasons and the varying hourly lengths of day and night throughout the year. Seasonal changes between the position of the sun and earth affect the intensity of ultra-violet radiation that sweeps across the ionosphere. During the Winter months, the earth is closer to the sun than during Summer months, and daytime ultra-violet radiation is more intense resulting in a stronger daytime ionosphere and higher reflected daytime frequencies during the Winter than during the Summer. On the other hand, here in the Northern Hemisphere, we have the longest periods of darkness during the Winter months. This permits the ionosphere more time to de-ionize and become weaker because of the lack of ultra-violet radiation, than during the Summer months. Consequently, Winter night-time reflected frequencies are considerably lower than Summer night frequencies.

The effects of these daily and seasonal variations upon an actual transmission path are shown in *Fig. 2*, a circuit analysis curve for June, 1952 and January 1953 for a path from the East Coast of the United States to Central Europe.

At this point it is appropriate to define an important term that will be used throughout this

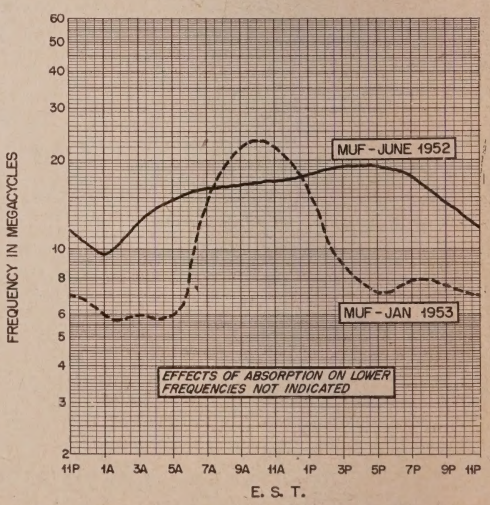


Fig. 2. This graph shows the median values of MUF that were observed on an East/West path during a Summer month of 1952 and a Winter month of 1953.

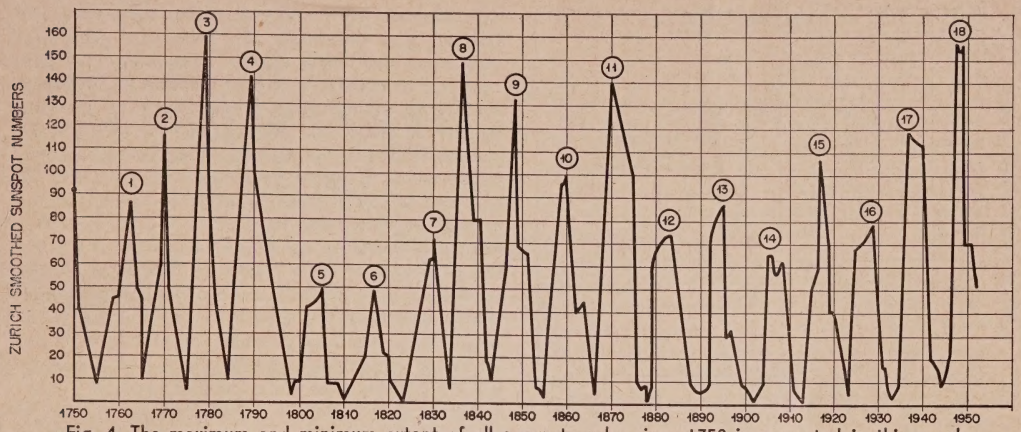


Fig. 4. The maximum and minimum extent of all sunspot cycles since 1750 is presented in this graph. Particularly note that cycle 18 was one of the highest in history having only been equalled by cycle 3 in 1779.

article. The *maximum usable frequency,* often abbreviated *MUF,* is the highest radio frequency that the ionosphere will reflect back to earth at a specific time for a given circuit. The value of MUF, at any specific time for a given circuit, will vary somewhat from day to day with varying ionospheric conditions. The monthly median value of the MUF is that value that will occur for 50% of the days of the month. The circuit analysis curve is a plot of the monthly median value of MUF's. This upper limiting frequency for the operation of a skywave radio circuit, is determined primarily by the extent of ionization of the ionospheric layers.

Sunspot Cycle

The daily and seasonal characteristics of the ionosphere are effects that can be explained more or less by the ever-changing relative positions between the earth and the sun. Aside from these explainable variations, there is another variation in the intensity of ultra-violet radiation from the sun. This long-period variation is referred to as the sunspot cycle.

The exact nature of sunspots, what they are and what causes them, is still rather obscure; however, science within the past twenty-five years has found that these blemishes on the face of the sun have an effect on shortwave radio transmission. *Figure 3* (our cover photo) is a photograph of the sun. The sunspots appear as black spots. They are believed to be gigantic temporary craters caused by explosions taking place on the sun. Sunspots almost always appear in groups. The groups range in visual size from small specks to large blotches.

Sunspots are known to have been observed by the Chinese as far back as 28 B.C. Long before present-day scientists associated these spots with violent disturbances on the sun, they were observed to come and go with a certain degree of regularity. Accurate scientific daily recorded observations of the sun were first undertaken during the 18th Century. Such daily observations are now made regularly at many astronomical observatories throughout the world.

The daily number of observed sunspots is subject to a considerable variation, and except possibly for association with certain types of ionospheric storms, daily sunspot observations have little correlation with general shortwave radio conditions. To obtain a true long-term trend, not colored by short-period fluctuations, monthly averages of the daily observations are reduced to the ***smoothed*** *sunspot number.* This value takes into account all the observations made during a one year period. It is the monthly values of smoothed sunspot numbers that exhibits the trend that develops into the well-known 11 year sunspot cycle.

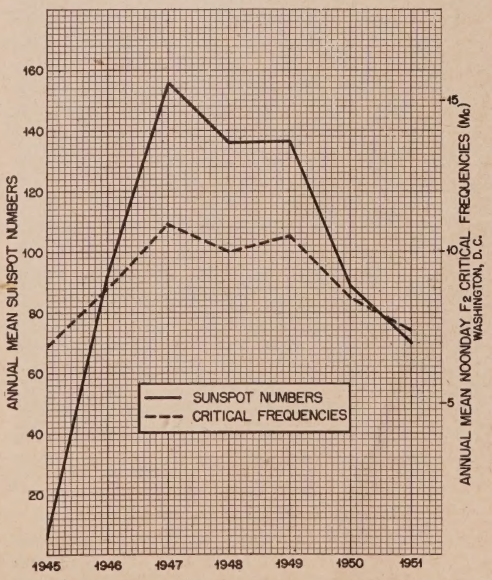


Fig. 5. In this comparison plot of critical frequencies at Washington and sunspot numbers it is possible to see that the critical frequency during a sunspot maximum is approximately twice that observed during a sunspot minimum.

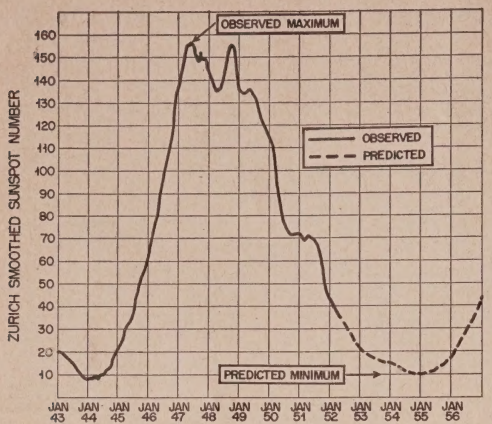


Fig. 6. This graph depicts the trend observed during the present sunspot cycle. While DX conditions at this writing will not get much worse, there is little indication that they will improve before 1956.

Figure 4 is a plot of all sunspot cycles since 1750, the year that reliable observations were first made. As seen from the curve, sunspot activity varies from year to year, but does so in a periodic manner to produce alternate minima and maxima at intervals of several years. The number of years necessary for a complete cycle of activity, from minimum, through maximum, to minimum again, varies somewhat with the different cycles, but has a mean period of 11.1 years. It is of interest to note, that seventeen complete cycles have been observed prior to the present cycle (18th).

It may seem a bit surprising to readers to find that in spite of the fact that sunspots have been regularly observed for over two hundred years, we know very little about what actually causes them. In fact, most of our present knowledge concerning certain effects associated with sunspots, came with the advent of radio. It was not until the late 1920's that sunspot activity was associated with the degree of ultra-violet radiation from the sun. During the rise in sunspot activity between 1924 to 1927, it was observed for the first time that there was also a similar rise in measured ultra-violet radiation. After 1929, as the sunspots started to decrease, so did the measured intensity of ultra-violet radiation also decrease. Although the cause and exact nature of sunspots are still unknown, they nevertheless are an observable indication of the degree of solar activity and associated ultra-violet radiation. Therefore, since ultra-violet radiation varies throughout an eleven-year cycle, so should ionospheric characteristics vary.

Ionospheric Measurements

About twenty-five years ago, two American scientists designed radio apparatus for probing the ionosphere. Its operation consisted of sending out pulsed radio waves vertically towards the ionosphere, and observing the time it takes for the echo or reflected pulse to return. In this way, it is possible to measure the height at which radio waves are reflected. By sending the radio wave vertically upward and observing the frequency that first penetrates the layers of the ionosphere (no echo returned to earth), it is also possible to determine the degree of ionization of the layers, or in other words, measure the effects of the ultra-violet radiation upon the ionosphere. The highest frequency at which a signal projected vertically will be returned to earth from a layer, is known as the *critical frequency* for that layer. The critical frequency is therefore the maximum usable frequency for a circuit of zero distance. The critical frequency is also actually related to the maximum usable frequency for a path of any distance. The relationship is one of geometry depending upon the height of the ionosphere, and the distance separating the transmitting and receiving stations.

Figure 5 is a plot of annual average values of noon-day F2 layer critical frequencies observed at Washington, D.C., since 1945, compared with annual mean relative sunspot numbers for the same period. It is apparent that the general trend of critical frequencies is in close agreement with the sunspot cycle trend, certainly indicating how the ionosphere responds to the changes in the activity of its producing agent—the sun. It can be seen from *Fig. 5* that the F2 layer critical frequency at sunspot maximum is approximately twice that value at sunspot minimum. This relationship is also true for the F2 layer maximum usable frequency for any particular circuit. It is now apparent that the cyclic characteristic of solar activity can govern general DX conditions over a long period of time.

Previous Sunspot Cycles and Prediction for Present Cycle

From *Fig. 4* one may study the characteristics of the past 17 recorded sunspot cycles. It is in-

(Continued on page 60)

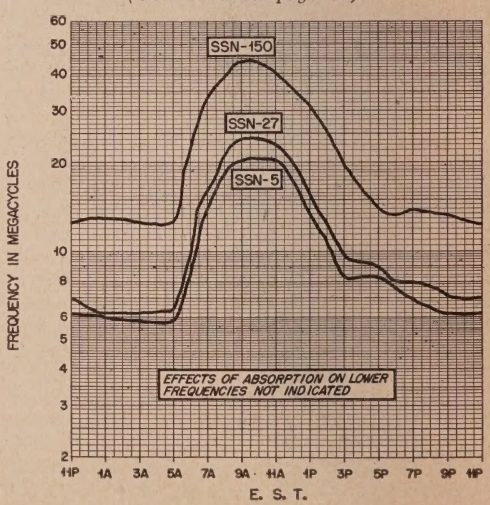


Fig. 7. The MUF over a specific path varies according to the smoothed sunspot number (SSN). The hump in this curve during the hours from 6A until 4P is due to ionization introduced in the daylight hours.

Phone Section Results

CQ's 1952 DX CONTEST

HERB BECKER, W6QD

Contributing Editor, CQ

The final results of the 1952 *CQ* World Wide DX Contest (Phone Section) are in the following columns. Results of the CW Section will be run next month. Judging from the comments on the logs turned in it appears that the boys really like this type of a contest. Naturally, we get various and sundry suggestions toward making some minor changes here and there. Some ask about shortening each period to 24 hours while others would like it on weekends that might be more favorable in respect to band conditions. However, a majority feel that a 48-hour session is not too long, especially when the first day might prove a flop, whereas the next day conditions might be better. Actually, that is the way it has worked out in several contests. On this business of different weekends . . . . we might like to change the dates, too, but unfortunately the world calendar of Ham contests is so filled that what few "open dates" remain would be of no use considering. We cannot just pick out what we would think to be the ideal dates because we would be infringing on another DX contests of some kind.

A few random comments picked from the logs: ZL2GX operating aids . . . . tea, many cups full supplied by the XYL. QRM . . . . visitors who "demanded" my company for two hours. EA8AX; "I like the World Wide Contest. Please send me log sheets for next year and if I am in the "world" I take part. Hi." ZS1KW; "would have spent more time but had to go to church and take the YL to the pictures." W1ATE; "very good contest, 75 meters better than last year." W4KE; "even this was fun which is saying a lot for a CW man. Hi." W7LVI; "my first contest and sure enjoyed it. Won't miss the next for anything." OK1MB; "Kindly send awards for first place on each band and also first place on all bands—thanks." SP5KAB; "this type of contest is the great thing on the way to international friendship and brotherhood." W6PWR op-





CE3CZ chalked up 245,769 for an all-band total. He runs 550 watts to a Philips QB-3.5/750 (equivalent of 4-250A), modulated by 100TH's. The HQ-129X shown in the photo has since been replaced by a Collins 75A-2. Antennas are 3-element rotaries for 10 and 20 meters, a fixed X-H array 80 feet high aimed on Europe for 21 Mc. and a 40-meter longwire for 40 and 80 meters . . . HB9MS rolled up a score of 173,442 points on all bands. It took 363 QSO's to do it. The shack had three receivers; a British Commander, an NC-200 and a converted BC-342. Several final p.a.s were used with 304TLS, 4-125As and a single 813. For antennas a 3-element beam was used on 20, a cubicle quad on 10, a ground plane on 75. The same antenna, without radials, was used on 40.





4X4DF was another high scorer, with an all-band total of 137,685. His transmitter is VFO-controlled with an 807 final, running 60 watts, and his receivers are an HQ-129X and a BC-342N. His antenna setup includes a long wire on 80 and 40, a Windom and a half-wave dipole for 20, for 15 a dipole, and for 10 a three-wire folded dipole. He expects to have a new 2-meter transmitter on the air shortly . . . W1ATE scored 131,930 points on all bands. Chad has three p.p. finals, 250TH's for 20 and 15, 4-250A's for 10 meters, and 250TH's for 40 and 80. Receivers are 75A2 and 75A3. The antennas at W1ATE are always changing but all of them are over 100 feet in the air. Latest are 3 wide spaced 4-element Yagis for 10, 15, and 20. On 40 a 3-element medium spaced rotary does it while a vertical half wave beam fills the bill on 80.

erating aid. . . . "no doze" pills and "friends" who drop in to see how the contest is going. W9NDA; "first CQ contest . . . . it's really rough. VE2IZ; "some U. S. stations don't know they can work Canadians. It is very funny sometimes." (This is very true. Many W's do not realize they can pick up 1 point per VE QSO. . . . *QD*).

A few station photos are shown, but I would like to mention that this does not mean these are the only stations in the contest worth publicizing. Of course, it's impossible to show you all the high ones, but some of these haven't been seen before.

Multiple operator stations: W6AM, assisted by W6GFE, W6BXL and W6KPC, had fun in scoring 61,270 on all bands. However, W6NIG assisted by W6RRG and W6HNX gave him a close run with 60,762. It is interesting to see that NIG had 27,650 on 20 where AM had 22,010. On the other hand AM had better distributed points thus bringing him out ahead in the all band score. W8NGO with W8CLR ran up 26,602 while W8DUS with W8UP and W8RAE scored 12,136. Another close one was between OZ9WS and OZ7SM. 9WS assisted by 4KX and 2PA had an all band total of 48,512 against 45,889 for 7SM who was helped by 7BG. Here again we see 7SM topping 9WS on 20 with 18,240 to 14,030. By looking at the tabulation you will see they both had the same number of zones and countries on 20, but 7SM had more contacts. KA2OM, helped by WØCWX, did a good job in running an all band score of 90,545 points.

Single operator stations: W1ATE was way out in front in USA with an all band score of 131,930. . . . on 20 he scored 65,920. Look at these three single-band 14 mc. scores . . . W6PWR 29,475, W6VVZ 28,875, W6UYX 28,832. VP6SU went to town as usual and his points added up to 188,736. We can't overlook the 245,769 points of CE3CZ nor the closeness of the scores of YV5BZ 61,944 and YV5AB 60,802. ON4SZ was the only one from Belgium to show up with a log. . . . his showed 60,363. Although CT1CL had an all band score of 106,665 we shouldn't overlook CT1BK with 56,516. ZS6TE came up with an all band score of 130,799 but ZS6TW concentrated on 20 only and wound up with a tremendous 139,764 for this one band. Another good score was that of 4X4DF with 137,685. It was good to see stations get on such as ZC4XP, CZ6UNI, OD5AD, ZK2AA, 5A2TO, VQ3BU, CT3AN, EA9AR, I1YAK, EA6AR and a flock of others who all helped make the contest a lot of fun.

Countries in which there has been only one participant will show the score under the All-Band section only. Certificates will be awarded in accordance with the Contest rules, and those stations receiving certificates are shown in bold face type.

Multiple Operator Stations

Scoring method: From left to right—station-zones-countries-total score.

United States

All Bands	W6AM	43—67—	61,270
	(W6GFE, W6BXL & W6KPC)		
	W6NIG	44—70—	60,762
	(W6RRG, W6HNX)		
	W6HOH	35—52—	37,584
	(W6CCP, W6RBW)		
3.5 Mc.	W6AM	6— 5—	176
	W6NIG	5— 4—	144
	W6HOH	4— 3—	91
14 Mc.	W6NIG	24—46—	27,650
	W6AM	21—41—	22,010
	W6HOH	20—35—	17,600
	W6YX	24—34—	11,774
	(W6VUW, IBY, OOU, JUU)		
28 Mc.	W6AM	16—21—	6,882
	W6NIG	15—20—	4,270
	W6HOH	11—14—	2,475
All Bands	W8NGO	35—59—	26,602
	(W8CLR)		
	W8DUS	31—51—	12,136
	(W8UP & W8RAE)		
3.5 Mc.	W8DUS	3— 3—	42
	W8NGO	4— 4—	40
14 Mc.	W8NGO	23—44—	17,018
	W8DUS	18—38—	5,355
28 Mc.	W8DUS	9—15—	864
	W8NGO	8—11—	456
All Bands	W9DWD	21—40—	8,540
	(W9GEM, W9DDP, W9MYC & W9JJO)		

Angola

All Bands	CR6BX	28—58—	33,024
	(CR6CB)		

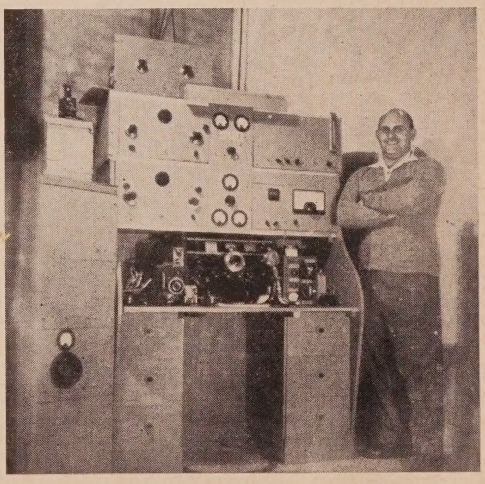
Multiple Operator Stations

Austria				
14 Mc.	OE13HP (OE13AB, TM, RN)	17—42—	12,980	
Bermuda				
All Bands	VP9BG(2)	21—31—	17,600	
Denmark				
All Bands	OZ9WS (OZ4KX, OZ2PA)	37—91—	48,512	
	OX7SM	32—77—	45,889	
	(OZ7BQ)	32—77—	45,889	
3.5 Mc.	OZ7SM	4—17—	1,281	
	OZ9WS	3—17—	960	
7 Mc.	OZ9WS	4—15—	684	
	OZ7SM	2— 9—	110	
14 Mc.	OZ7SM	19—41—	18,240	
	OZ9WS	19—41—	14,030	
21 Mc.	OZ9WS	4— 6—	190	
	OZ7SM	1— 1—	6	
28 Mc.	OZ9WS	7—12—	874	
	OZ7SM	6— 9—	645	
England				
All Bands	G5TN (G3AWZ)	29—90—	50,575	
	G3HDA (G3HCT)	17—47—	9,280	
3.5 Mc.	G5TN	5—22—	1,458	
	G3HDA	1— 7—	42	
7 Mc.	G5TN	2—15—	238	
	G3HDA	2— 8—	100	
14 Mc.	G5TN	22—53—	26,775	
	G3HDA	9—27—	4,212	
Eritrea				
All Bands	MI3BL (MI3NA & MI3JV)	23—51—	29,600	
Finland				
All Bands	OH3OX (OH3QB, OH3QL, OH3QM & OH3QP)	14—43—	8,557	
Germany				
All Bands	DL9CI (DL1CR & DL9GG)	23—61—	24,612	
Guatamala				
All Bands	TG9AD (TG9HM)	38—55—	41,385	
14 Mc.	TG9 B(2	11—2 —	10 184	
	TG9AD	14—23—	8,056	
Italy				
All Bands	I1BDV (I1ARP, I1RP)	50—104—	70,996	
Japan				
All Bands	KA2OM (WØCWX)	30— 61—	90,545	
Poland				
All Bands	SP9KKA (9KY, 9KC)	12— 24—	2,448	
7 Mc.	SP9KKA	3— 4—	56	
14 Mc.	SP5KAB (5AX, 5AR)	6— 22—	2,352	
	SP9KKA	9—18—	1,620	
Portugal				
All Bands	CT1BS (1BW)	56—135—	95,882	
	CT1FM (1NT, 1DX)	37— 97—	70,484	
3.5 Mc.	CT1BS	7— 22—	1,711	
	CT1FM	3—14—	374	
7 Mc.	CT1BS	11— 35—	4,416	
	CT1FM	6— 18—	984	
14 Mc.	CT1EY (1YE)	22— 55—	29,799	
	CT1FM	15— 45—	22,620	
	CT1BS	22— 48—	16,870	
28 Mc.	CT1BS	16— 30—	4,876	
	CT1FM	10— 14—	1,104	
Turkey				
	TA3AA (W6OME, W1VQG)	40—116—	226,512	
Uruguay				
All Bands	CX6AR (7AR)	8— 8—	1,320	

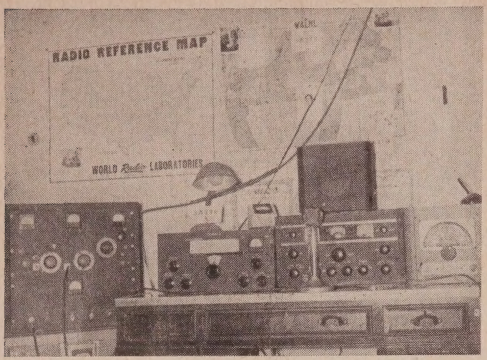
Multiple Operator Stations
North America

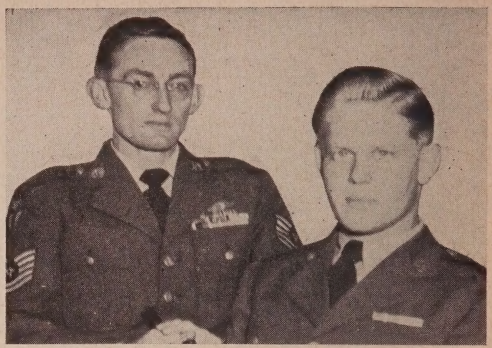
U.S.A.				
All Bands	W1ATE	50—117—	131,930	
3.5 Mc.	W1ATE	8— 15—	989	
14 Mc.	W1ATE	27— 76—	65,920	
	W1KSK	16— 18—	288	
28 Mc.	W1ATE	15— 26—	4,387	
All Bands	W2FZJ	18— 27—	3,690	
3.5 Mc.	W2FZJ	3— 5—	208	
	W2ICE	4— 6—	121	
14 Mc.	W2SKE	23— 49—	26,612	
	W2FZJ	9— 17—	1,118	
All Bands	W3LXE	27— 50—	15,246	
	W3ZQ	21— 39—	8,340	
14 Mc.	W3ZQ	20— 38—	8,004	
	W3LXE	15— 36—	7,395	
28 Mc.	W3LXE	7— 9—	640	
	W3ZQ	1— 1—	2	
14 Mc.	W4DOH	23— 48—	23,359	
	W4HA	14— 30—	3,564	
	W4KE	6— 8—	252	
All Bands	W5LFG	22— 32—	5,454	
	W5BMM	7— 11—	396	
14 Mc.	W5RPJ	13— 22—	2,135	
	W5FNA	5— 9—	195	
	W5BMM	4— 8—	180	
	W5LFG	6— 8—	168	
28 Mc.	W5LFG	16— 24—	3,560	
	W5SFW	13— 18—	2,325	
All Bands	W6SRF	31— 53—	24,444	
	W6IBD	24— 35—	16,992	
	W6CHV	31— 38—	10,695	
	W6BJU	24— 33—	10,260	
	W6DRR	22— 27—	5,782	
3.5 Mc.	W6IBD	4— 4—	112	
	W6CHV	3— 3—	24	
	W6BJU	3— 3—	18	
14 Mc.	W6PWR	26— 49—	29,475	
	W6VVZ	24— 51—	28,875	
	W6UYX	23— 45—	28,832	
	W6YY	21— 45—	17,028	
	W6IBD	20— 31—	13,974	
	W6SRF	19— 35—	11,610	
	W6BJU	17— 26—	7,052	
	W6CHV	18— 25—	4,902	
	W6DRR	18— 22—	4,160	
	W6ATO	12— 15—	1,377	
	W6LMZ	7— 7—	294	
	W6BYH	3— 3—	27	
28 Mc.	W6JDO	12—15—	2,595	
	W6SRF	12—18—	2,280	
	W6CHV	10—10—	740	
	W6DRR	4— 5—	162	
	W6BJU	4— 4—	104	
	W6NJU	2— 2—	15	





ZS6TE made 130,799 points on all bands. Receiver is an AR-88 and the rig uses a pair of T-55's on all bands except 21 Mc., where an 814 does the job. In the antenna department he has 3-element arrays for 10 and 20, with dipoles used on 40 and 80. The 10 meter all driven array is used on 11 and 15 meters . . . CT1CL wound up with 106,665 points and made 290 contacts. The station is about a half mile from the Atlantic and has good height. He runs about 50 watts into an 807. The receiver is an SX-28 while the antennas consist of 3-element rotary arrays for 10 and 20 and a 134-foot wire for 40 and 75.





5A2TO did a good job in running up 101,115 points with 448 QSO's. He runs 150 watts into an 813; receiver is an AR-88 with a 3 element wide spaced beam being used on 20 and a folded dipole on 10 . . . KA2OM (to the rear) ran up 90,545 points, mostly on 20 meters. He was assisted by WØCWX. They use p.p.par. 813's with a kw. input. Receiver is a 75A2 and the antenna is a 3-element rotary, 97 feet high. KA2OM (W5MIJ) will be back at his old home stand by the time you read this.

Single Operator Stations

North America

All Bands	W7DL	30	53	25,315
	W7HAD	24	32	12,152
	W7PQE	21	23	4,620
3.5 Mc.	W7DL	7	6	221
	W7HAD	6	5	220
	W7PQE	4	4	64
14 Mc.	W7GUI	24	54	25,740
	W7DL	23	47	20,160
	W7LVI	24	46	17,080
	W7HAD	18	27	8,865
	W7JUO	17	21	2,736
	W7PQE	11	14	2,100
28 Mc.	W7AHX	12	13	1,325
	W7PQE	6	5	143
All Bands	W8NXF	40	69	25,506
	W8FJR	15	26	1,886
14 Mc.	W8RHP	26	60	22,446
	W8LIO	24	52	21,204
	W8NXF	20	42	9,362
	W8VQD	14	20	1,564
	W8FJR	9	20	1,102
28 Mc.	W8NXF	15	22	2,738
	W8FJR	5	5	80
All Bands	W9EWC	41	69	28,710
	W9NDA	34	58	24,748
	W9EZD	31	55	16,770
	W9ABA	11	18	1,073
3.5 Mc.	W9NDA	7	7	448
	W9EDC	6	7	260
	W9EZD	2	2	36
14 Mc.	W9NDA	27	51	18,486
	W9EWC	22	43	10,787
	W9EZD	18	36	6,426
	W9FDX	11	20	2,077
	W9ABA	8	15	552
28 Mc.	W9EWC	13	17	2,400
	W9EZD	11	17	1,876
	W9ABA	3	3	78
All Bands	WØDCB	29	38	6,834
14 Mc.	WØANE	19	29	4,660
	WØMCX	16	27	4,214
	WØDCB	14	24	2,470
28 Mc.	WØGEK	15	32	6,768
	WØDCB	12	12	864
	WØBPO	7	10	680
Canada				
All Bands	VE1CR	18	36	10,638
	VE2IZ	18	28	6,026
3.5 Mc.	VE2IZ	3	3	138
14 Mc.	VE2IZ	15	25	4,320
	VE2CK	16	28	3,696
All Bands	VE3KF	33	68	37,875
14 Mc.	VE3KF	23	53	23,104
	VE3RM	10	22	2,208
	VE3API	3	3	30
14 Mc.	VE5DR	13	13	988
All Bands	VE7VO	27	45	19,700
	VE7AIH	11	13	1,560
14 Mc.	VE7VO	22	41	15,246
	VE7AIH	4	6	160
21 Mc.	VE7AIH	7	7	686
28 Mc.	VE7MS	10	12	1,364
Alaska				
14 Mc.	KL7AFR	16	36	14,560
	KL7AON	11	14	3,575
Cuba				
All Bands	CO2OZ	40	66	44,308
3.5 Mc.	CO2OZ	3	3	36
7 Mc.	CO2OZ	7	9	368
14 Mc.	CO2OZ	20	43	21,987
28 Mc.	CO2KC	12	13	975
	CO2OZ	10	11	840

South America

Barbados				
All Bands	VP6SD	59	133	188,736
Guantanamo Bay				
14 Mc.	KG4AF	13	22	3,990
Mexico				
14 Mc.	XE1TR	11	15	2,604
Panama				
14 Mc.	HP1TS	17	34	14,790
Argentina				
28 Mc.	LU1BK	19	26	8,100
Brazil				
All Bands	PY2AHS	41	74	46,805
	PY4CB	40	63	31,518
	PY4RJ	28	53	22,761
	PY1AQT	23	65	21,120
14 Mc.	PY4CB	25	44	18,216
	PY1AQT	21	44	13,260
	PY2AHS	22	35	12,711
	PY4RJ	18	38	12,152
21 Mc.	PY4RJ	10	15	1,625
	PY1AQT	9	14	828
28 Mc.	PY2AHS	19	39	10,672
	PY4CB	15	19	1,428
	PY2AUC	7	9	592
Chile				
All Bands	CE3CZ	65	118	245,769
	CE6AE	27	33	18,060
14 Mc.	CE3CZ	24	51	56,250
	CE3CK	19	31	16,150
	CE6AB	14	15	2,030
28 Mc.	CE3CZ	22	43	34,190
	CE6AB	13	18	18,060
	CE1AJ	20	23	14,416
	CE4BX	14	18	7,648
Curacao				
14 Mc.	PJ2AA	12	32	16,896
Uruguay				
All Bands	CX3BH	50	69	42,602
3.5 Mc.	CX3BH	2	3	10
7 Mc.	CX3BH	2	3	10
14 Mc.	CX3BH	18	26	5,544
21 Mc.	CX3BH	10	11	567
28 Mc.	CX3BH	18	26	8,844
	CX5CE	9	9	738
	CX3BT	5	4	99
Venezuela				
All Bands	YV5BZ	33	56	61,944
	YV5AB	37	64	60,802
7 Mc.	YV5AB	4	4	56
14 Mc.	YV5BZ	21	47	41,412
	YV5AB	21	44	34,905
21 Mc.	YV5AB	10	14	1,392
28 Mc.	YV5BZ	10	7	1,479

Europe

Austria				
14 Mc.	OE13AAP	17	42	12,980
Balearic Islands				
14 Mc.	EA6AR	5	16	1,092
Belgium				
All Bands	ON4SZ	48	123	60,363
Czechoslovakia				
All Bands	OK1MB	30	80	37,296
	OK1HI	23	76	30,789
3.5 Mc.	OK1MB	5	20	2,080
	OK1HI	3	17	1,120
7 Mc.	OK1HI	4	18	704
	OK1MB	4	10	322
14 Mc.	OK1HI	15	40	12,265
	OK1MB	12	36	8,880
28 Mc.	OK1MB	9	14	1,104
Denmark				
All Bands	OZ5KP	17	27	3,784
	OZ3XP	9	25	2,040
	OZ9BR	5	27	1,472
3.5 Mc.	OZ9BR	2	10	440
	OZ5KP	3	8	165
7 Mc.	OZ9BR	1	7	70
14 Mc.	OZ7HT	17	46	16,443
	OZ8AJ	12	34	6,384
	OZ3XP	6	17	1,035
	OZ5KP	9	12	696
	OZ9BR	2	10	280
21 Mc.	OZ5KP	1	1	6
28 Mc.	OZ5KP	7	14	1,050
	OZ7I	3	4	126

Single Operator Stations

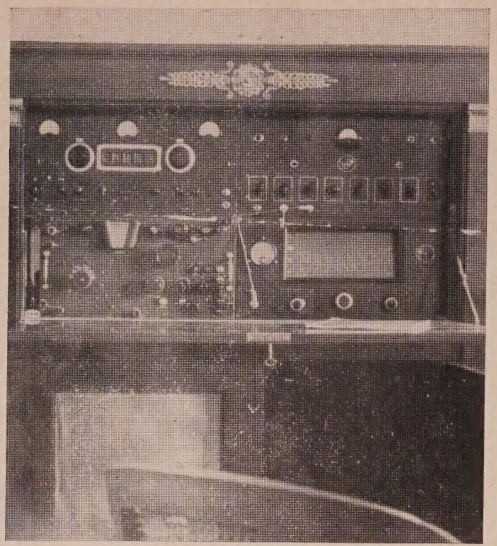
Europe

England			
14 Mc.	G3GNC	20—40—	9,720
	G3FXB	13—31—	6,336
	G2MI	14—31—	5,895
	G3HTW	3—10—	403
Finland			
All Bands	OH5NQ	26—61—	16,182
3.5 Mc.	OH3NY	2— 7—	108
	OH5NQ	3— 8—	99
7 Mc.	OH5NQ	4— 8—	216
14 Mc.	OH5NQ	11—35—	5,934
	OH1OW	7—17—	1,392
28 Mc.	OH5NQ	8—10—	540
France			
All Bands	F9RM	39—91—	47,320
	F8XP	25—48—	10,512
	F8PQ	23—36—	5,782
	F3TS	13—15—	1,482
	F3PW	13—16—	1,392
	F3YE	12—13—	1,375
	F8HR	11—11—	506
	F8BO	2— 7—	117
3.5 Mc.	F9RM	4—19—	1,725
	F8BO	1— 5—	42
	F8PQ	1— 1—	2
7 Mc.	F9RM	4—11—	375
	F8PQ	2— 3—	15
14 Mc.	F9RM	23—50—	17,447
	F8PQ	10—19—	1,566
	F8XP	5—17—	1,100
	F3ES	6— 9—	420
	F3YE	4— 5—	261
	F3TZ	3— 9—	168
	F3TS	4— 4—	64
	F8HR	3— 3—	27
21 Mc.	F3PW	6— 8—	350
	F8HR	8— 8—	320
	F3TS	6— 7—	273
	F8XP	6— 7—	208
	F3YE	6— 6—	192
	F9RM	4— 7—	176
	F8BO	1— 2—	18
28 Mc.	F8XP	14—24—	2,964
	F8PQ	10—13—	920
	F3PW	7— 8—	345
	F3TS	3— 4—	168
	F9RM	4— 4	72
	F3YE	2— 2—	24
Germany			
All Bands	DL1VR	51—123—	68,382
	DL1LH	36— 85—	37,994
	DL1FI	36— 89—	35,00
	DL1EI	39— 82—	27,709
3.5 Mc.	DL1VR	3— 15—	522
	DL1FI	3— 14—	442
	DL1LH	2— 14—	416
7 Mc.	DL1VR	3— 17—	580
	DL1FI	2— 12—	294
14 Mc.	DL4EA	30— 78—	56,376
	DL1VR	21— 52—	14,746
	DL1FI	19— 46—	12,480
	DL1LH	17— 35—	8,112
	DL6WD	5— 14—	513
21 Mc.	DL1VR	12— 18—	1,740
	DL1LH	6— 11—	493
	DL1FI	6— 10—	384
28 Mc.	DL1LH	10— 21—	3,069
	DL1VR	12— 21—	2,475
	DL1FI	6— 7—	221
	DL1YA	2— 2—	12
Iceland			
14 Mc.	TF5SV	6—21—	3,996
Italy			
All Bands	I1AMU	35—89—	36,828
	I1BKF	26—75—	23,937
3.5 Mc.	I1AMU	2— 4—	18
7 Mc.	I1BKF	4—14—	524
	I1AMU	3—13—	432
	I1SXZ	1— 2—	9
14 Mc.	I1AMU	13—44—	10,716
	I1CSP	10—28—	5,472
	I1BKF	6—31—	4,625
	I1CCO	8—24—	2,668
	I1CYV	5—20—	1,100
	I1SXZ	4— 6—	12
21 Mc.	I1BKF	7—17—	1,224
	I1AMU	8—15—	943
28 Mc.	I1SXZ	13—22—	2,310
	I1AMU	9—13—	836
	I1BKF	8—12—	660
Malta			
All Bands	ZB1KA	6—16—	546
Netherlands			
All Bands	PAØVB	22—57—	13,551
	PAØGMU	9—35—	4,708
	PAØALO	10—13—	805
	PAØHJK	10—12—	506
	PAØKE	5—10—	480
3.5 Mc.	PAØVB	3—14—	595
	PAØHJK	4— 4—	64
	PAØGMU	1— 5—	42
	PAØKE	1— 1—	2
	PAØKDM	1— 1—	2
7 Mc.	PAØVB	3—11—	280
	PAØGMU	2— 9—	154
	PAØEEM	1— 6—	56
	PAØHJK	3— 4—	35
14 Mc.	PAØUV	14—24—	3,382
	PAØVB	10—24—	3,366
	PAØGMU	6—21—	2,322
	PAØRE	7—18—	1,448
	PAØKE	4— 9—	403
	PAØGWB	4— 8—	252
	PAØALO	4— 4—	80
21 Mc.	PAØVB	6— 8—	110
	PAØALO	3— 4—	84
	PAØHJK	3— 4—	70
28 Mc.	PAØALO	3— 5—	104
North Ireland			
All Bands	GI5HZ	13—25—	2,926
Norway			
All Bands	LA4DD	11—35—	4,002
3.5 Mc.	LA6FA	1— 2—	6
7 Mc.	LA4DD	5—12—	391
14 Mc.	LA4DD	6—23—	1,856
	LA6FA	2—10—	444
Poland			
14 Mc.	SP5AB	7—20—	3,996
Portugal			
All Bands	CT1CL	52—123—	106,665
	CT1PK	43— 98—	56,516
	CT1MB	18— 38—	6,496
	CT1ST	16— 38—	3,496
3.5 Mc.	CT1CL	5— 19—	960
	CT1PK	3— 11—	280
	CT1ST	1— 2—	8
7 Mc.	CT1CL	5— 11—	496
	CT1PK	5— 10—	374
	CT1ST	2— 2—	16
	CT1MB	1— 4—	15





EA4CM attained a score of 88,862 on all bands. His equipment, which is totally home constructed, consists of a 150-watt transmitter with an 813 final, and a double-conversion 16-tube receiver. For antennas he uses a folded dipole on 7 and 21 Mc., and a three-element rotary beam for 14 Mc. . . . YV5BZ scored 61,944 on all bands. Rig winds up with a pair of 813's with 500 watts input. Receiver is an HQ-129X. A 3-element close spaced rotary is used on 20; whip folded dipoles do the job on 10 and 40.





ON4SZ ran up 60,363 points. He runs 75 watts into an LS50 and the receiver is a BC342N with two crystal converters for 21 Mc. For antennas three long wires do a good job for him. ZL2GX surprised himself by scoring 45,122 points on one band, 14 Mc. Jock runs 100 watts into a 100TH. Receiver is homebuilt dual conversion job and a Q5-er. The antennas (2) are twin-three beams which were described in Radio some time ago but obviously still do a mighty fine job.

Multiple Operator Stations

Europe

14 Mc.	CT1CL	24—	58—	32,226
	CT1JM	18—	44—	33,146
	CT1PK	17—	46—	14,366
	CT1ST	7—	19—	1,352
	CT1MB	5—	16—	756
28 Mc.	CT1CL	18—	35—	7,685
	CT1PK	18—	31—	6,468
	CT1MB	12—	18—	2,310
	CT1ST	6—	11—	476

Saarland

All Bands	9S4AX	9—	33—	3,134

Scotland

All Bands	GM2DBX	15—	45—	11,220
7 Mc.	GM2DBX	1—	10—	209
14 Mc.	GM2DBX	14—	35—	8,232
28 Mc.	GM3CSM	4—	4—	80

Spain

All Bands	EA4CM	49—	108—	88,862
	EA5AQ	4—	13—	357
7 Mc.	EA4CM	6—	15—	887
	EA5AQ	2—	2—	16
14 Mc.	EA4CM	19—	51—	17,710
	EA5BD	4—	20—	1,920
	EA5AQ	2—	11—	221
21 Mc.	EA4CM	9—	16—	1,700
28 Mc.	EA4CM	15—	26—	6,478
	EA3GT	4—	5—	171

Sweden

All Bands	SM5ARL	19—	60—	18,486
	SM4BTF	14—	40—	8,046
3.5 Mc.	SM5ARL	2—	15—	595
	SM4BTF	2—	8—	160
	SM5GR	3—	5—	88
7 Mc.	SM5ARL	2—	8—	130
	SM4BTF	2—	5—	49
	SM7AKO	1—	3—	16
14 Mc.	SM5FA	24—	53—	34,034
	SM5BCO	23—	46—	16,836
	SM5WL	26—	49—	14,325
	SM3EP	17—	39—	10,980
	SM5ARL	12—	34—	8,280
	SM5TF	13—	31—	6,468
	SM4BTF	10—	27—	4,662
	SM3AXX	12—	31—	4,257
	SM5WJ	13—	20—	2,607
	SM3ACP	6—	23—	2,523
	SM7TQ	11—	20—	2,015
	SM3AV	5—	16—	1,071
	SM4PG	8—	13—	567
	SM5PW	2—	2—	16
28 Mc.	SM5ARL	3—	3—	36

Switzerland

All Bands	HB9MS	57—	154—	173,442
	HB9LA	57—	132—	82,782
3.5 Mc.	HB9MS	25—	109—	3,597
	HB9LA	6—	18—	1,296
7 Mc.	HB9LA	9—	23—	1,432
	HB9MS	5—	21—	1,118
14 Mc.	HB9MS	26—	74—	56,100
	HB9LA	23—	59—	18,368
	HB9MU	7—	21—	1,260
21 Mc.	HB9LA	9—	18—	1,512
	HB9MS	7—	10—	408
28 Mc.	HB9MS	11—	24—	3,010
	HB9LA	10—	14—	912

Trieste

All Bands	I1YAK	38—	78—	38,976

Yugoslavia

All Bands	YU2CF	13—	34—	4,606
14 Mc.	YU2CF	8—	19—	1,566
	YU1AG	3—	16—	1,484

Africa

Algeria

14 Mc.	FA3JY	18—	40—	15,602
	FA9UO	6—	20—	2,652
21 Mc.	FA9RZ	7—	16—	1,866

Angola

All Bands	CR6AI	40—	72—	55,664
	CR6AG	20—	42—	15,934
14 Mc.	CR6AI	21—	39—	13,740
	CR6AG	11—	19—	2,130
28 Mc.	CR6AI	19—	33—	13,936
	CR6AG	9—	23—	5,952

Canary Island

All Bands	EA8AX	11—	15—	2,912

Cape Verde Islands

All Bands	CR4AC	18—	28—	9,982
7 Mc.	CR4AC	1—	2—	45
14 Mc.	CR4AI	10—	23—	4,884
	CR4AC	7—	6—	520
28 Mc.	CR4AC	10—	20—	4,860

Libya

All Bands	5A2TO	37—	68—	101,115

Madeira Island

All Bands	CT3AN	28—	32—	6,389

Mozambique

All Bands	CR7AF	15—	25—	2,600
14 Mc.	CR7AR	9—	9—	738
	CR7AF	5—	10—	285
28 Mc.	CR7AF	10—	15—	1,150

South Rhodesia

All Bands	ZE3JO	10—	14—	840

Spanish Morocco

All Bands	EA9AR	20—	40—	15,240

Swaziland

All Bands	ZS7C	34—	66—	41,800

Tanganqika

All Bands	VQ3BU	34—	69—	58,607

Union of South Africa

All Bands	ZS6TE	44—	95—	130,799
	ZS1MP	37—	67—	61,880
	ZS1KW	38—	61—	43,362
14 Mc.	ZS6BW	31—	83—	139,764
	ZS6TE	27—	58—	43,845
	ZS1KW	23—	34—	10,545
	ZS1MP	16—	29—	10,485
28 Mc.	ZS6TE	16—	35—	21,586
	ZS1MP	19—	35—	19,491
	ZS1KW	15—	27—	10,626

(Continued on page 61)

A New, Simplified

Q5-er

ROBERT H. WEITBRECHT, W6NRM/W9TCJ

Yerkes Observatory, Williams Bay, Wisc.

Up and down the bands, in the magazines, in the radio stores, everywhere you go it is the same old story: selectivity. We present here an inexpensive solution to your own selectivity problems—Editor.

There are, of course, several ways to tighten up the pass-band of the receiver, but the one of greatest interest naturally will be the one that requires the least commensurate tightening of the belt. OK, so this is another Q5-er article. Of course it is, for the components from that little inexpensive low frequency Command receiver (the BC-453) can do a pretty expensive job. Before you skip on to the next page with the idea that you know what I am going to say just take a good look at the diagram and picture over here and you'll see that this one is different.

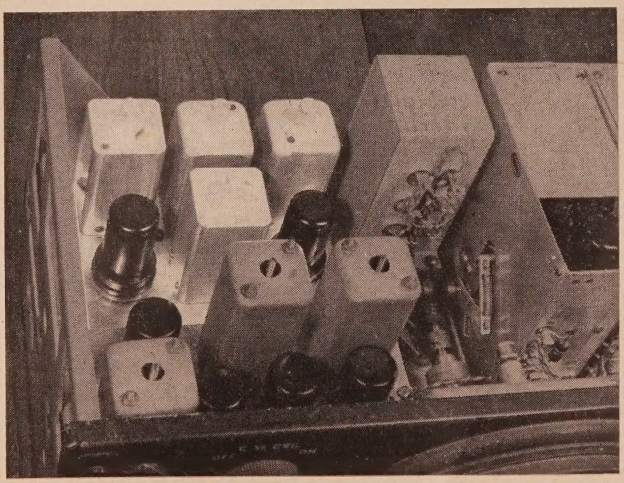
In case you missed it, the difference is this: most of the Q5-er designs seem to be appendages to the receiver. For example, one involves the use of the whole surplus receiver, r.f., i.f., and audio, picking up the i-f signal from the regular receiver and feeding it into the Command receiver which is tuned to the regular receiver's i-f channel. This method makes the operator a victim of the poor audio quality available from the command receiver.

Another popular method is to take the i-f transformers out of the BC-453 and build up a Q5-er with them, using one stage to convert the regular receiver i.f. to 85 kc., then feeding this frequency through the Q5-er and back into the regular receiver's second detector which is rewired to take the 85-kc i.f. instead of the receiver's regular channel. This is a better and neater way of adding the Q5-er to your receiver, however, it is still necessary to rewire the second detector circuit and to modify the beat oscillator to match the 85-kc i.f. This is fine for you budding lab technicians, but what about us Hams?

The Double Conversion Q5-er

My arrangement preserves the receiver second detector, beat-frequency oscillator, and audio system just as it is. To add this Q5-er to the receiver requires only the breaking of one little old wire in the receiver's i-f system.

The circuit, as you may be able to decipher from



The Q5-er, shown here mounted in the dynamotor well of the BC-348. The filament and plate current demands of the unit are extremely moderate.

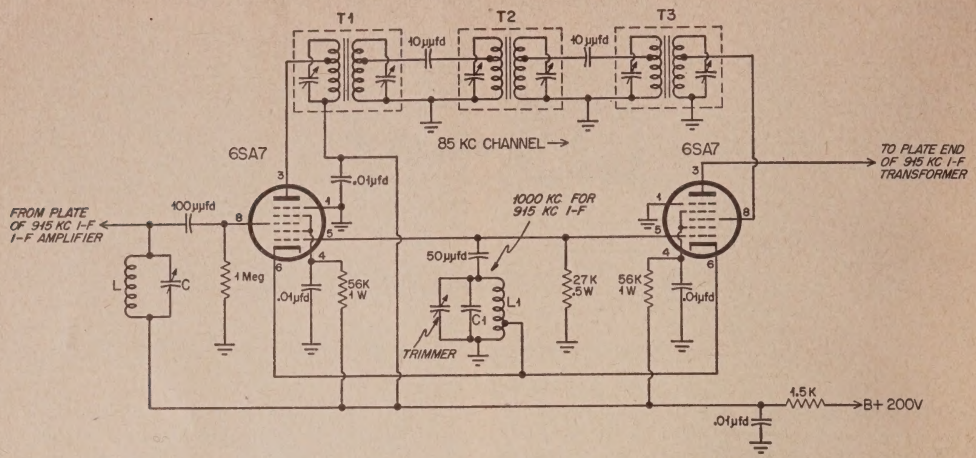


Fig. 1. This wiring diagram shows the arrangement used with a BC-348 receiver. There is no in/out switching network (see page 27). The L/C circuit in the grid of the first 6SA7 is tuned to the receiver i-f channel, but may be substituted for by a 10 mh. r-f choke. The L1/C1 circuit tunes either 85 kc. above or below the receiver i-f channel. T1, T2 and T3 are 85 kc. i-f transformers from a BC-453 receiver. A typical value of L1 (for 1000 kc. oscillations) would be 80 turns of #30 DCC closewound on a ¾-inch form, tapped 8 turns from the cathode end. C1 would be a combination amounting to approximately 350 μμfd., partially silver mica and partially a small trimmer.

Fig. 1, consists of two 6SA7 converter tubes with their oscillator sections in parallel so that they both generate a common injection frequency. Thus the receiver i.f. is converted to 85 kc. by the input 6SA7, the 85 kc. is fed through the three cascaded transformers swiped from the BC-453 to the second 6SA7, which converts it back to the receiver i.f. and feeds it back into the remainder of the receiver. The three cascaded transformers do an excellent job of honing and stropping the signal down to ideal sharpness as may be appreciated by the graph, *Fig. 2.*

The receiver in the photo, a BC-348, uses a 915-kc i.f. To convert this to 85 kc. for the cascaded transformers to get their teeth into it was only necessary to tune the 6SA7's oscillator (L1-C1) to either 85 kc. above 915 kc. or 85 kc. below. For esthetic reasons the sum was chosen: 1000 kc. (besides being a nice round number it was easy to calibrate). If you have a 455-kc. i.f. it might be well to use a 550-kc frequency for the 6SA7's, being checkable on the low end of your BC receiver.

Construction and Adjustment

The dynamotor well of the BC-348, as may be seen in the photo, turned out to be an ideal size for the unit and it was built on a slice of alumninum and mounted there. Placement of parts is of no great importance due to the low frequencies involved, but it is a good idea to keep the input and output circuits well separated so that the i-f signal will not bypass the Q5-er through stray circuit capacitances. This caused me no trouble and probably won't bother you.

The receiver never misses the puny 8.5 ma. @ 200 volts d.c. and 0.6 ampere at 6.3 volts a.c. requirements of the unit.

For neatness, the oscillator coil can be mounted in an i-f can similar to those of the 85-kc i.f. transformers. The original small-capacity trimmer in the top of the can will be used for fine frequency adjustment of the oscillator with silver mica condensers padding the circuit up to approximately the desired frequency. The oscillator, a Hartley circuit, has proven quite stable and no touch-up of the original tuning of the circuit has been needed even when using the crystal filter.

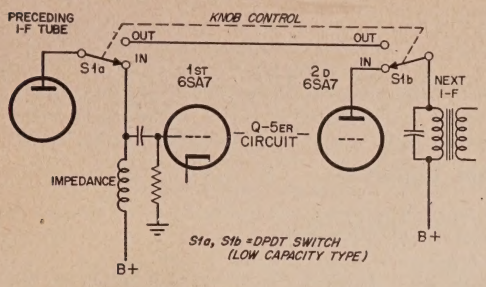
Before starting the alignment of the unit check the three 85-kc transformers and make sure that the bakelite rods on top of the transformers are up. These rods are a coupling adjustment and loosest coupling is obtained with them up.

Alignment Procedure

Tune the receiver to a steady signal and adjust the Q5-er oscillator until maximum volume is obtained. Next touch-up the tuning of the trimmers on the 85-kc i.f. transformers, reducing the receiver gain as the transformers come into tune and the output increases. Then turn on the crystal filter, make sure the signal is on the selectivity peak of the receiver, and make the final adjustment of th Q5-er oscillator. Check the tuning of the receiver's i-f transformers and re-peak them.

The upshot of all this should be very high selectivity. When you tune in a c.w. signal there should be a great difference between one side of zero beat and the other. On my BC-348 the signal disappears just after I tune through zero beat. With both the crystal filter and the Q5-er in the circuit approximate measurements show a rejection ratio of 300 to 1 or better, which corresponds to *50 db. at two kilocycles off resonance.*

The overall gain of the Q5-er system should be about unity at resonance. The two 6SA7 tubes



Suggested in/out switching system for re-inserting "normal" selectivity. Although not used by the author, there is no reason to suspect that it will deteriorate the operation of the Q5-er. Note particularly that the switch must be of a very low capacity.

give just about enough conversion gain to offset the loss due to the three cascaded 85-kc transformers.

Special Alignment Procedure for RTTY

The Q5-er is just about ideal for radio teletype work since the added selectivity rejects adjacent-channel signals and isolates the desired signal. A full blow-by-blow description of how a teletype receiving system works has been described in the August 1952 *CQ*, p. 29, so I won't go into detail on this topic. The teletype receiving converter requires two audio tones from the receiver: 2125 and 2975 cycles. Naturally, if you have your selectivity peak 2125 cycles away from the frequency you are primarily interested in you will find precious little tone to operate the teletype equipment. What you want to do is to put the selectivity peak midway between the two frequencies: namely 2550 cycles.

It is simple to set your receiver at this point. Tune in a steady signal (such as WWV) using the crystal filter to get the exact peak. Now remove your hand from the tuning knob and keep away from it. Turn off the crystal filter, and increase the b-f-o pitch control until the beat note is 2550 cycles. This can be checked with an audio oscillator, a piano, or, as in my case, by watching the teletype converter indicator magic eyes (or scope) for an equal reading indicating that equal signals are coming through both channels. You are now tuned up ready to go. The crystal filter is not used for RTTY work since it makes the selectivity so high that you cannot tune in both of the transmitted frequencies at once, since they are 850 cycles apart.

A.V.C. for RTTY

While you are in your receiver making the conversion to the Q5-er you might as well, if you are going to be doing any RTTY operation, make a provision for the automatic volume control system to function while the b.f.o. is in use. The a.v.c. function is very helpful in RTTY reception and should be used. Unfortunately, the bulk of the receivers on the market use the same switch setting to turn off the a.v.c. and turn on the b.f.o. You can either rewire this switch a bit, add another switch for the a.v.c., or else put in a switch with one more position on it to give you both a.v.c. and b.f.o.

One of the first things you think about when you start to use the Q5-er is "where did everybody go?" All of a sudden there are separate signals all up and down the band instead of one single mass of bleeps and boops. Almost to a man the real DX'ers have something of this nature built in to sort out the good ones from the locals. Most of your top phone DX men have been putting in Q5-ers too.

Of course, there is never anything that is all good and no bad, and the Q5-er is certainly no exception. There have been several cases so far reported of hard feelings rising as a direct result

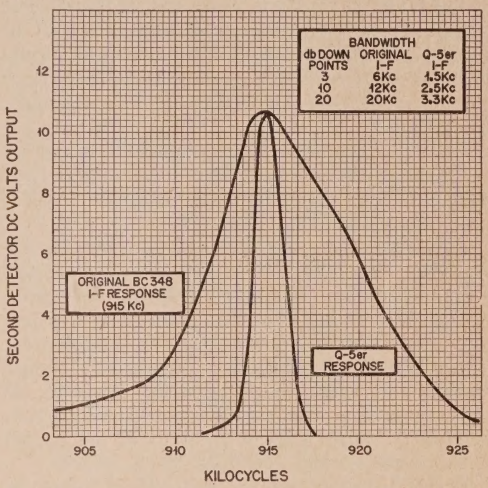


Fig. 2. A comparison of the selectivity curves of the BC-348 before and after adaption to the Q5-er.

of someone installing a Q5-er circuit. What usually happens is that some old friend hears his buddy on and plops down a kc. or two away and gives him a short blast. Nothing happens. He gives a longer call. Still nothing. It never occurs to the fellow with the regular receiver with which he can hear everything that is happening anywhere near the channel that his buddy didn't even hear him. If the buddy was working a good DX station the fellow will probably never recover. He'll never be really convinced. Oh well, the misfortunes of technological advancement.

The month of July marks the debut of the *Radio Amateurs' Mobile Handbook*. We'll tell you all about it at booth 59 during the ARRL Convention at Houston, Texas on July 10th, 11th, and 12th.

In a Fit of Pique
or
A Realistic Look at TVI

DALE L. HILEMAN, WØMCB

c/o Collins Radio Company, Cedar Rapids, Iowa

The author, in submitting this article, asked, "Is Ham radio here to stay?" Actually the TVI situation has neatly resolved itself—into complete frustration. If the whole thing wasn't so pitiful; it would be funny—maybe!—Editor.

It is said that TVI can be licked. And no doubt it can be licked. A Ham with a well-equipped radio laboratory, several research assistants, a staff of public relations experts, and an unlimited supply of time and money, can, under favorable circumstances, completely eliminate any TVI he might be causing.

The catch, you no doubt have guessed, lies in my tacit use of the phrase "under favorable circumstances." What do we mean by "favorable"? What circumstances? "Under"?

To illustrate, let me trace the career of Homer X. Longfellow, WØBLAH. Homer was an average Ham—a healthy, red-blooded American youngster. He got his call in 1946, when Ham radio was just awakening from its wartime slumber. His first rig was a 6V6 crystal oscillator driving an 807. Homer spent many happy hours pounding brass on 40 meters, working other equally happy, healthy, red-blooded American men in all parts of the United States.

In 1947, Homer was in high school, when he first heard about TVI. He laughed it off, thinking, "Oh, well, this can never happen to me." But Homer was mistaken. His graduation from high school in 1948 marked the beginning of a new phase of Homer's life—his fight with the *Tennessee Valley Indians.*

Homer took it in his stride, cooperating in every way with his neighbors in an effort to minimize interference. At first he received only occasional scattered complaints from 25 or 30 TV owners in his area. In every case he agreed to stay off the air during the hours requested by each neighbor.

But soon he had agreed to so many of these requests that his evening operating time was reduced to thirteen minutes during a nightly TV soap commercial. Now, Homer decided, was the time to TVI-proof his rig.

Homer lived in a big city where the TV signal strength was very high. Consequently, TVI elimination was a cinch. Homer spent $175.43 (his life savings) on silver mica button capacitors, hy-pass capacitors, shielded wire, coaxial cable, an enclosed cabinet, a line filter, a low-pass antenna filter, and various other small, inexpensive parts with which to build his new rig.

During his first semester in college, Homer flunked three subjects. But he did manage finally to complete the rig. With his new rig, Homer found that TVI was reduced impressively; he now averaged only about 15 complaints a week.



". . . five minutes later a neighbor broke the door down and assaulted Homer with a machete . . ."

Remarkably enough, Homer was graduated from college in 1952. He then went to work for a radio corporation in Seeno River, Iowa. Seeno River was 50 miles outside the nearest fringe area. So, armed with four years of intensive training in electronics and communications, Homer set about building the perfect, TVI-proofed rig.

Now $750 in debt, Homer regarded his bright, shiny new transmitter with justifiable pride. He plugged it in, hooked it up, and let forth with a 250-watt CQ.

Five minutes later, a neighbor broke the door down and assaulted Homer with a machete. A few reassuring words from Homer, however, gained the man's confidence. The two sat down and quietly discussed the difficulty; it was only BCI—Homer could cure it in a flash. After bandaging his wounds, Homer set about installing bypass condensers, shields, low-pass filters, and a wave trap on the man's radio.

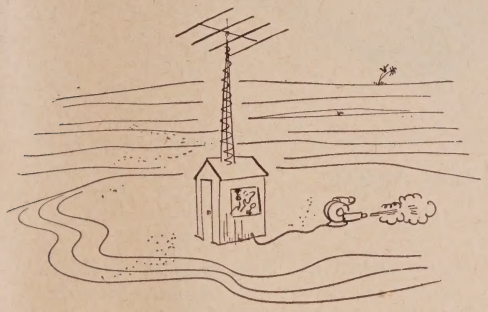
Homer operated in the evenings for one week without experiencing further complaints. Certain-

ly he had heard the last of TVI. But one night the sweet old lady down the hall knocked on Homer's door. "You got a Ham set?" she asked.

"Yes, maam, I do. What can I do for you?"

"I can't see nothin' on the television, and I wanna see the fights. Gorgeous Jim is fightin' Knot-Nosed McGee tonight."

Homer checked—and sure enough—it was TVI! He assured the sweet old lady that he would remedy the trouble as soon as possible. The next day Homer learned that a petition was circulating in the neighborhood to revoke his license, fine him $10,000, tar and feather him, and send him to jail for a period of not less than fifteen years. People began calling him on the telephone at all hours of the day and night, complaining of noises in their radios, TV sets, phonographs, toasters, vacuum cleaners, and refrigerators.



". . . obvious solution—set up in the middle of the Sahara Desert . . ."

The calls and complaints multiplied, while, perplexed by this latest development, Homer stayed off the air until he could find the source of his trouble.

An additional investment of $350 bought Homer a *Q*-meter, a grid-dip meter, a vacuum-tube voltmeter, an oscilloscope, a signal generator, a high-frequency receiver, a distortion analyzer, and a textbook on mathematical analyses of complex waveforms.

With the use of this equipment Homer found that his rig was perfectly clean, but that his signal on 75 meters had been beating with a local police-radio station, a local FM station and the 150th harmonic of a broadcast station in Tulsa, producing signals in TV receivers of sufficient magnitude to completely block out the incoming 5 microvolt TV signals.

Finally, Homer's landlord gave Homer an ultimatum: "For the last three weeks you've been blottin' out all the radios and TV sets for blocks around. I don't wanna lose no tenants or no business in my store on account of you. Quit operating that thing."

"But," said Homer, "I haven't been on the air for a month."

"That don't make no difference. Either quit or move."

So Hamdon lost another Ham.

"No use trying any more," said Homer. "Maybe things will be different someday . . . maybe . . ."

Can TVI be licked? I believe it can. We can see that Homer, after all, is not a typical Ham; we must condemn him for his ill will, lack of perseverence, and unwillingness to cooperate with the public. Several obvious solutions to the TVI problem immediately come to mind:

1. Go mobile and drive 50 miles from the city for each QSO. Do this at night, park in an abandoned granite quarry, and operate with your headlights off.

2. Go on the ultra-violet or infra-red bands. Caution: do not use light waves—light waves are visible and may possibly subject you to a city ordinance regulating the use of illuminated advertising signs.

3. Set up your shack in the middle of the Sahara Desert. You will probably have to purchase a motor-generator to do this. For information on desert maintenance of motor-generator sets, see Signal Corps Manual TB-SIG-75.

4. Use semaphores.

Although the above measures are not guaranteed to eliminate TVI, I am confident that the ingenuity and resourcefulness of thousands of American Ham radio operators more diligent than Homer will some day bring forth developments in the field of communications which will make TVI a thing of the past . . . maybe!

Elegy in a Country Ham Shack

The curfew tolls the knell of parting day;
The teardrops spatter softly on the key;
He pulls the switch, and sobbing, turns away,
And leaves the band to others, and to me.

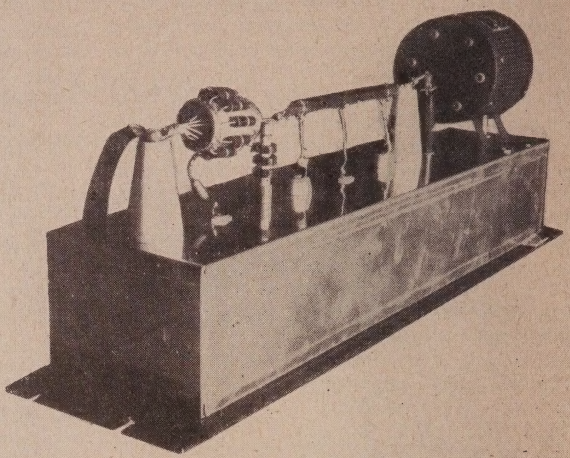
No more the QSO's with distant climes.
No more the Hi-Hi laughter's happy ring.
Ne'er more shall he await the postman's chimes.
To see what QSL's the day will bring.

O, how the rig shall stand in darkness dank!
The 807's silent, grim, and cold.
Grey cobwebs being spun from off the tank;
The oscillator colored green with mold.

Friends call! His call! He hears but answers not.
Fierce anguish in his breast is firmly mired.
To study for his class "B" he forgot. . . .
And yesterday, his Novice tag expired.

Roger Sklar, KN2AFZ

Additional Notes on the True-Matcher



Capt. R. R. HAY, USN, W4LW

610 North Buchanan St., Arlington 3, Va.

Nothing is so impermanent as amateur radio equipment. As soon as the "True-Matcher" (December 1952, *CQ*, page 12) had been completed we started thinking about modifications. The new version takes up less space, costs less, and presents a better appearance than the original unit.

The revised circuit is shown in *Fig. 1* and is basically the same as that originally used, with the following exceptions:

1. Feed-through condenser *C2* is replaced by a standard 500-$\mu\mu$fd silver mica type.

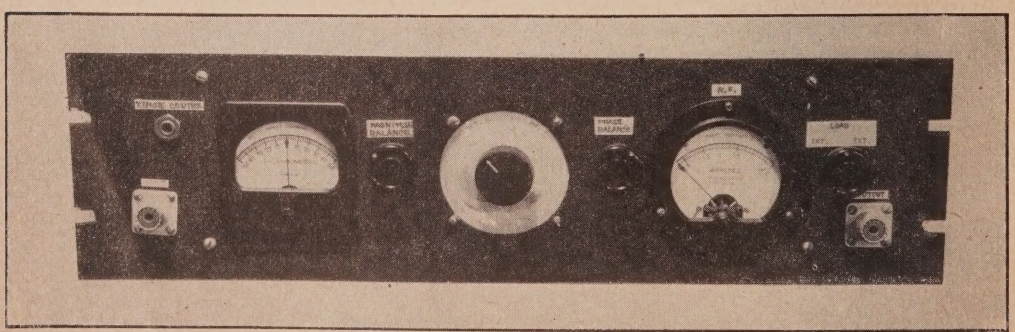
2. The original 300-$\mu\mu$fd. condenser, *C9*, has been replaced by a feed-through, 500 $\mu\mu$fd. condenser.

3. One galvanometer has been eliminated and a switch has been provided so that a single galvanometer can be connected to either the phase detector or the magnitude detector, directly or through a 150,000-ohm resister.

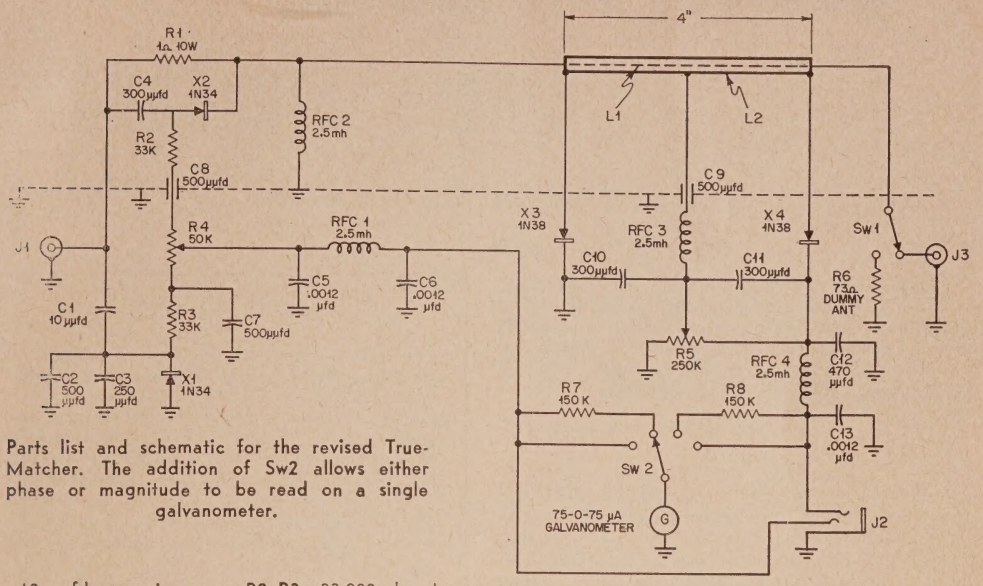
4. The four prong socket, *J2*, has been replaced by a 3-way jack. This jack is used when the "True-Matcher" is used to control an automatic antenna tuner.

5. *L1* and *L2* have been replaced by a piece of RG-11/U coaxial cable. One inch of the outside conductor has been cut away at each end, leaving a section 4 inches long. Connections are made at each end of the outside conductor and at its center.

The use of co-ax cable for the construction of



Panel view of the revised True-Matcher. The elimination of one of the galvanometers of the original unit helps reduce its size and cost considerably.



Parts list and schematic for the revised True-Matcher. The addition of Sw2 allows either phase or magnitude to be read on a single galvanometer.

C1—10 μμfd. ceramic condenser
C2—500 μμfd., silver mica.
C3—250 μμfd., silver mica condenser
C4—300 μμfd., ceramic condenser
C5, C6, C13—1200 μμfd. ceramic condenser
C7—500 μμfd., ceramic condenser
C8—500 μμfd., feed-through type, ceramic condenser
C9—500 μμfd. feed-through ceramic.
C10, C11—300 μμfd., silver mica condenser
C12—470 μμfd., ceramic condenser
R1—1 ohm, 10w. non-inductive resistor (ten 10-ohm, 1w. composition resistors in parallel)
R2, R3—33,000 ohm, 1w.
R4—50,000 ohm potentiometer
R5—250,000 ohm potentiometer
R6—Ohmite, D-101, 73 ohm dummy ant.
R7—10,000 ohm ½w. resistor
L1, L2—6-inch section of RG-11/U coaxial cable. Braided ends of outer section trimmed to 4 inches.
X1, X2—1N34 crystals
X3, X4—1N38 crystals
RFC1-4—2½ mh. chokes
G1—75-0-75 μa. galvanometer
A—0-2 r-f ammeter
Sw1—S.p.s.t. low-loss switch.
Sw2—4 pole, single-throw switch.
J1, J3—co-ax connectors
J2—3-circuit jack.

L1 and *L2* insures uniform spacing between the two inductances. It also simplifies construction.

The constructional details are shown in the photographs. The front panel is a 5¼" relay-rack meter panel intended for use with three 3" meters. The galvanometer, *G*, is mounted at the left end of the panel, while the r-f ammeter, *A*, is mounted at the right end. The center meter hole is filled with an aluminum plate, on which is mounted the meter switch, *S2*. The front panel also carries the co-ax connectors *J1* and *J3*, the balancing potentiometers *R4* and *R5*, load switch *S1*, and jack *J2*.

Behind the panel is an aluminum chassis 4" x 17" x 3". On the rear of this chassis are mounted *R1, R2, R6, RFC2, L1, L2, C8* and *C9*. The remainder of the components are mounted inside the chassis. No attempt has been made to shield the components of the two detectors which are mounted on the back of the chassis. *R6* carries its own shield. *RFC2* acts as a common support for one end of *L1* and one end of *R1*.

Inside the Shack and Workshop

Inexpensive Identification Labels

Very neat and permanent identification labels for marking tube sockets, switches, jacks, terminal strips and the like for use on transmitters, receivers, etc., may easily be made by typing (or writing with pen or pencil) on *Dennison PRES-A-PLY* self sticking labels and then spraying with a heavy coat of *Krylon* plastic spray.

All required labels should be typed or lettered at one time, the unused labels being removed by cutting or tearing the backing sheet, and then spraying the entire sheet (with the labels still attached) with *Krylon*. The individual labels can then be removed from the backing sheet by bending the sheet and rolling it between the fingers away from the labels. It may be necessary to lift a corner with a knife when an extra heavy coating of sypriy is applied. It is important that all oil and grease is removed from the chassis or panel surface before applying labels.

Frederick H. Wise, W3LGK

Getting Started on Single Sideband

JACK N. BROWN, W3SHY, ex-W4OLL

16 Crest Ave., RFD 1, Bristol, Penna.

This part of the SSB Series is the first of three parts dealing with linear amplifiers and the basic theory behind linear amplification. Part IV sets the stage for the following two parts which include the design and description of a low-power, beam-tetrode amplifier, and a one-kilowatt low-mu triode amplifier.

Part IV

In the second and third parts of this series we have shown how it is possible to generate single-sideband signals by either the filter or phasing method. The remaining problem is to amplify these signals to a high enough level so that they can hold their own in the presence of modern-day QRM.

Let us take a quick look at the quality of the SSB signal we have generated in these two exciters. Either one of the two units, when properly aligned and operating conservatively into a proper load, is capable of 40 db. attenuation of the undesired sideband—this is the intelligible stuff that we so painstakingly have filtered or phased out. There are also other sorts of signals that appear not only in the spectrum occupied by the undesired sideband but in the region of the transmitted sideband as well. These signals are the products of distortion in heterodyning and amplification of our SSB signal. These "distortion products" are not intelligible and are just so much garbage as far as conveying any sense to the distant receiver is concerned. The two SSB exciter units will have distortion products that are approximately 50 to 60 db. below the peak value of the transmitted sideband voltage. This is pretty darned clean. If we could just retain these attenuation ratios everything would be just dandy. Unfortunately, we can't and upon trying to do so hangs the tale that follows.

Linear Amplification

Let us look into the more important aspects of linear amplification and leave the fine points to your homework reading periods. First, what is a linear amplifier? It is one that faithfully reproduces all of the amplitude variations of the input signal in the amplifier output circuit. This is simple.

What classes of amplifiers are linear amplifiers? What are some examples? Class A amplifiers are the best known of the lot. The average plate current remains constant, the grid voltage never (but never) swings into the positive region and the distortion products are so low as to be negligible. Examples? The r-f and i-f amplifiers in your receiver are class A. So are the microphone preamp and low-level stages in your modulator. The efficiency is quite low—the peak efficiency is of the order of 25% to 35%.

Class AB1 amplifiers are somewhat like class A amplifiers in that the grid never swings positive and therefore never draws grid current. However, the average plate current will swing upward on peaks of input signal voltage. The efficiency is higher, theoretical maximum is 55%, but the distortion products are worse. Not much, but enough to be noticeable. Since the two classes of amplifiers discussed above do not draw grid current there is no grid driving power required. Actually, this is not true because we must supply the grid circuit and coupling circuit losses. Fortunately, this doesn't amount to much—a fraction of a watt,

(Continued on page 65)

SSB STANDARDS

The author has had numerous occasions to give suppression reports to "newly-arrived" SSB stations. When the report is given—say 20 db. suppression of the upper sideband—I am invariably asked "Is that enough?" My answer is NO! Just how much should we have? Obviously, as much as possible, but practical limits dictate something on the order of the following: With an eye to the future and continued crowded band conditions your signal should be clean enough to permit working on the same carrier frequency but opposite sideband from another group of SSB stations. This necessitates SSB receivers and all. We should have at least 25 db. suppression at the minimum and should strive for 30 db. This is not too much to expect of amateur stations and amateur techniques. If this single-sideband business is really worth the trouble, it is certainly worth the trouble to get the signal as clean as possible. After all—20 db. means that 1/10 of your signal voltage is appearing in the adjacent channel—that's 1/100 of your output power, and for a kilowatt, that is an appreciable amount of watts. Remember—aim for 30 db. and if you come up with 40 or 50 db. suppression send me a collect telegram and let me know how you do it.

W3SHY

The Bookcase Transmitter

VAN COURT HARE, JR., W4JJK

John Jay Hall, Columbia University, New York 27, N. Y.

This article describes a thoroughly practical, 80-meter, 10- to 25-watt, c-w transmitter, which is no larger, and no more conspicuous, than the average book. Grounding the case permanently eliminates any shock hazard from an a-c/d-c power supply.—Editor

The little transmitter described here is ideal for low-power Novice and general amateur work in the 3.5- to 3.8-Mc CW band. Built around a pair of 50B5's in a push-pull, crystal oscillator circuit, a plate voltage of 120 volts, furnished from a simple a-c/d-c power supply, will give an input of approximately ten watts. Also, although far above the ratings of the tubes, it has been operated with a plate voltage up to 250 volts without apparent ill effects. This type of operation allows an input up to twenty-five watts. We recommend, however, that under these operating conditions, you do not hold the key down for long periods of time.

Construction

Figure 1 shows the circuit of the transmitter, and the photographs indicate its construction. It is built in a case formed by sawing a standard 7 x 6 x 2-inch aluminum chassis in half, using one half for the chassis and the other half for the cover. Several 6-32 screws, in holes drilled and tapped to accommodate them, hold the halves together. Similar manufactured boxes can also be obtained.

Because the pictures show clearly the placement of most of the components, little comment about construction is required. One point worth mentioning, however, is the necessity of carefully insulating *C1* and *C2* from the case. The two r-f chokes are not visible in the pictures. They are mounted behind the crystal socket and under the bracket holding the 50B5's.

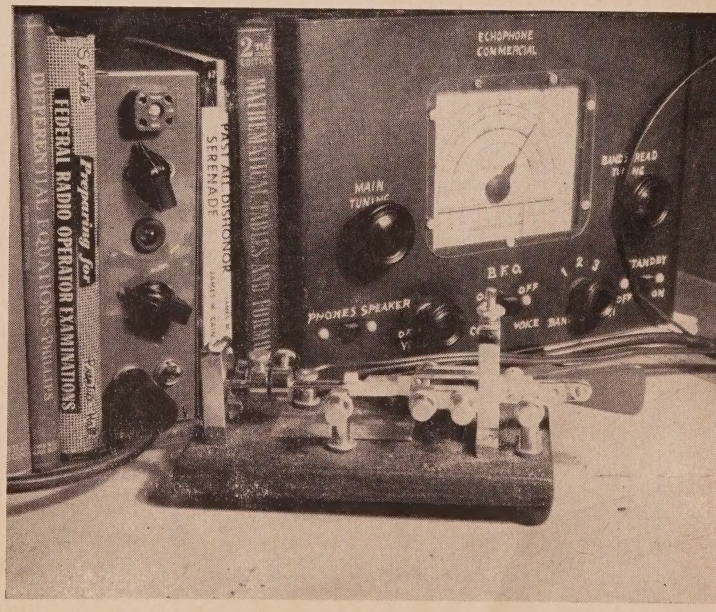
The coil forms are of polystyrene and are ¾-inches in diameter. They were salvaged from a piece of *war-surplus* gear; however, they are a standard stock item *(Amphenol No. 24, National PRF-2,* etc.). If your eagle eye notes a slight deformity of their tops, do not be alarmed. It is not the result of the heat generated in the transmitter. Rather it was caused by an oversize soldering iron used in disassembling the surplus gear.

To insure equal heat distribution, *R1* and *R3* are mounted on the end of the chassis away from the tubes. If desired, a 135-ohm resistance line cord can be substituted for *R3* with a reduction of the ambient temperature in the case. The case gets fairly warm in three or four hours of operation, but not dangerously so. Actually, the only heat-sensitive unit is the crystal, and it is well shielded from the heat. Helping to keep the heat within reasonable limits are a dozen or so ¼-inch holes drilled in the back of the box.

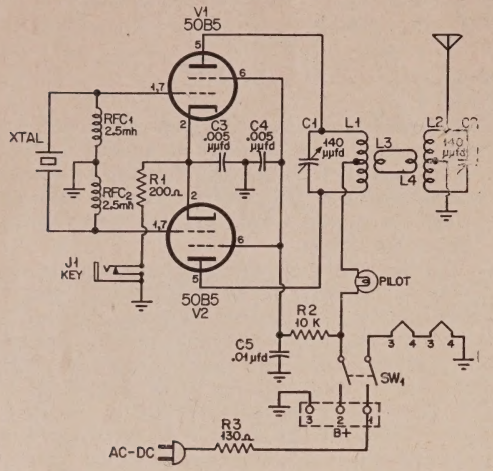
A *Jones* terminal strip is used for antenna and power connections.

Antenna Tuner

The specified antenna tuner is designed for use with an end-fed wire, ½-wave long (approximately



The Bookcase Transmitter on the operating table. The knob just below the crystal socket is for adjusting tank-circuit tuning, and the other one is the antenna tuning condenser. Plate current is indicated by the pilot light and the switch is to turn the equipment on or off.



C1, C2—140 μμfd. variable (Hammerlund APC)
C3, C4—0.005 μfd., 200 w.b.d.c. for 120-v. operation, 400 w.v.d.c. 400 w.v.d.c. for 200-250-v. operation (Aerovox P288 or P488)
C5—0.01 μfd., 400-w.v.d.c. (Aerovox P488)
R1—200 ohms, 10w. (Ohmite Brown Devil)
R2—10,000 ohms, 1w.
R3—130 ohms, 10w. (Ohmite Brown Devil) or 135-ohm line cord
RFC1, RFC2—2.5 mh. r-f chokes (Millen R50)
Pilot—#47 6-8v., 150 ma. pilot bulb
J1—single circuit phone jack for key
SW1—d.p.s.t. toggle switch
Xtal—3.5-3.8-Mc crystal
V1, V2—50B5 tubes
Equivalent parts may be substituted for those specified

Fig. 1. Wiring schematic and parts list.

130 feet). It will compensate for differences in length of up to twenty per cent or so, but greater variations will probably require experimental adjustment of the number of turns in *L2*, in order to achieve proper loading.

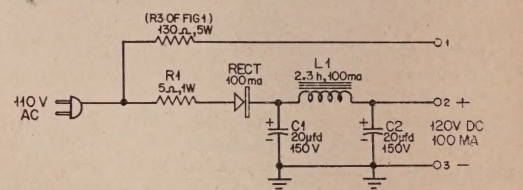
Power Supplies

The transmitter has been operated from several different power sources. They include the power supply diagrammed in *Fig. 2;* a transformer-type supply, and a 115-volt d-c power line. The power supply of *Fig. 2* may be built in the upper corner, or along the back, of the transmitter case.

For maximum safety in transformerless operation, the transmitter case is connected permanently to a good ground and only a single "hot" connection made to the power line. If the tubes do not begin to heat within fifteen seconds after the power plug is inserted in the wall socket, just reverse the plug. The importance of grounding the case cannot be overstressed. Otherwise, the full line voltage may very easily appear on it and the key. *(See the Novice Shack, CQ, October, 1952, for a discussion of operating a-c/d-c transmitters with safety.—Editor)*

As stated earlier, the transmitter has been operated at a plate voltage of 250 volts and an input of twenty-five watts, without ill effects, even though such operation far exceeds the ratings of the 50B5's. *(If a transformer type power supply capable of furnishing this much power is available, it will probably be capable of furnishing 6.3 volts as well. In this event, it is possible to substitute 6AQ5's for the 50B5's by rewiring the filament terminals for parallel operation from the 6.3-volt source. No more power can be run, but this possible substitution is mentioned for the benefit of those whose conscience would bother them while overloading the 50B5's.—Editor)*

When the transmitter is operated from the d-c line, the positive side of the line is connected to the plate input terminal through a fifty-ohm, one-watt, protective resistor.



C1, C2—20/20 μfd., dual, Aerovox AF44D
R1—5 ohms, 1w.
R3—see Fig. 1.
L1—2.3 hy. choke at 100 ma., Stancor C2304
Rect.—selenium, FTR 1006

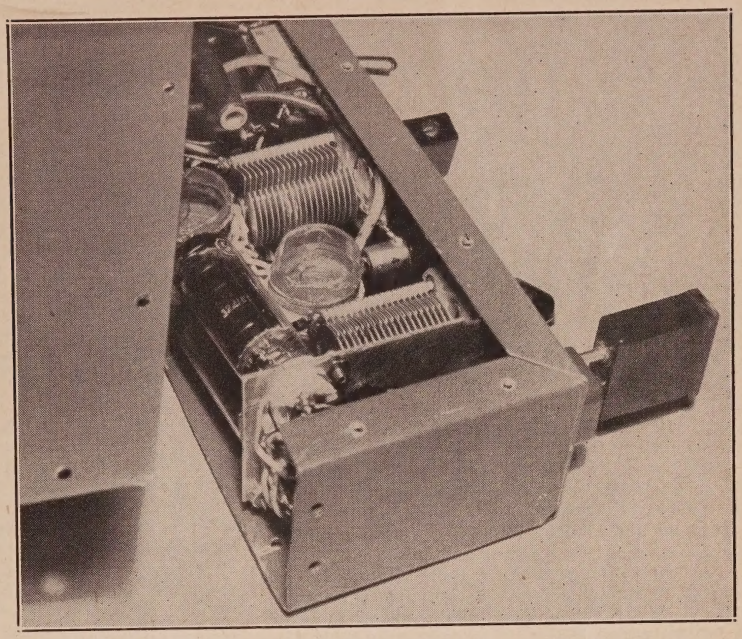
Fig. 2. This is a practical a-c/d-c power supply for the transmitter. The numbered terminals correspond to those shown at the bottom of Fig. 1. It is also possible to "steal" the power from certain types of communications receivers by replacing the send/receive switch with a s.p.d.t. unit and wiring it into the power supply lead.

Tuning

To tune the transmitter, connect the antenna and set *C1* and *C2* to maximum capacity. Tune *C1* to a capacity slightly less than that which causes minimum glow of the plate-current bulb. Next, retune *C2* for an increase in plate current, retuning *C1* as necessary to keep the stage oscillating. Excessive antenna coupling will preclude tuning *C2* to resonance. Find the setting that causes most plate current to flow without causing erratic keying or preventing oscillation. If either occurs, reduce the number of turns in *L3* or *L4*, so that

Coil Winding Data

L1—44 turns #24 d.c.c. wire close wound on ¾" form. Center tapped.
L2—50 turns #24 d.c.c. wire, close wound on ¾" form. Center tapped.
L3, L4—3 turns insulated hookup wire wound around centers of L1 and L2. Adjust for proper loading. (see text)



Inside the transmitter identity and placement of components are clearly evident. The NO-47 pilot-light, current indicator is supported by being pushed partially through a 3/8-inch O.D. rubber grommet in the center of the panel.

C2 can be tuned to resonance without overloading the oscillator.

Once coupling and *C2* are adjusted, tune *C1* for maximum power output consistent with good keying, which will occur with *C1* tuned a trifle to the low-capacity side of resonance.

With the higher plate voltages, it is possible that tuning as described above could result in over 100 milliamperes of plate current being drawn by the tubes. If available, therefore, it might be wise to connect a milliammeter in series with the key lead during preliminary tuning to insure that total current does not exceed 100 to 110 milliamperes.

We have used the *Bookcase* transmitter for high-speed contacts while preparing for a Commercial radio-telegraph examination, and one of my friends has used it in the Novice band. As is normal with low power transmitters, its signal strength depends greatly upon the antenna to which it is connected.

Inside the Shack and Workshop

Soundproof Relay Case

When the XYL objects to the usual racket of a clicking relay, especially from an electronic keyer, try using this stunt to silence the relay.

Obtain an old car radio vibrator unit with sufficient pins for all necessary connections. The radio service shops usually throw them away and will no doubt give you a few. Remove the unit proper and install the relay in place of the vibrator unit; taking care that the movable parts do not bind on the sponge rubber housing. Not only does this quiet a relay but also seals it from dust and provides a simple mounting.

"Doc" Lamb, WØPHD

Makeshift Dial Index

A professional and inexpensive dial index may be easily made by drilling the panel on a line perpendicular to the shaft of a control and just at the edge of the dial. The hole is countersunk and a flat head screw, of appropriate size, is fitted flush with the panel surface. An alternate method is to use a filister head screw, in which case it is not necessary to countersink the hole. However, the hole should be drilled farther from the dial edge to insure sufficient clearance. The finish of the screw should be chosen to match other hardware on the panel.

Cliff Kurtz, W9CJD

Inexpensive Identification Labels

Very neat and permanent identification labels for marking tube sockets, switches, jacks, terminal strips and the like for use on transmitters, receivers, etc., may easily be made by typing (or writing with pen or pencil) on *Dennison PRES-A-PLY* self sticking labels and then spraying with a heavy coat of *Krylon* plastic spray.

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Frederick H. Wise, W3LGK

The Monitoring Post

As the accompanying picture attests, W5CF, Fort Worth, Texas, has had considerable success in riding a hobby within a hobby. About five years ago, he conceived the idea of working as many as possible of those amateurs whose call letters following the number are the same letter doubled or tripled: for example, W2CC, W5FFF.

Theoretically, 520 such combinations should be possible in the ten U. S. call areas; however, only about half of them have actually been issued. Of this number, another half are inactive or unworkable for one reason or another. As a result, it has taken W5CF five years to make 112 authentic QSO's and accumulate 103 QSL cards, all in the picture.

Most of the contacts were the result of special schedules. And some of them required a lot of work by the cooperating amateurs, ranging all the way from erecting a special antenna to building a complete new rig. W5CF is sending a postal-card size duplicate of the picture to stations who cooperated with him, and he would like to hear from others with call letters consisting of the same letter repeated. Object: QSO. Also, W5CF would like to receive the other nine QSL cards promised him. Address: R. E. Cowan, W5CF, P.O. Box 1299, Fort Worth, Texas.

From the casual conversation of six W2 old timers on the 28-Mc. band in November of 1947, the Quarter Century Wireless Association, Inc., has grown to a membership of almost 600 from the forty-eight states and eight foreign countries. The Fifth Anniversary Dinner was attended by 175 members.

To be eligible for membership in the QCWA, you must have been licensed twenty-five years ago and must now be licensed. W2FX, W2IN, W2PF, and W2FIT are the elected officers of the club. They will be glad to send additional information.

In Chicago, if you call CEdarcrest 3-7388, you get The Royal J. Higgins Co., a firm representing manufacturers of electronic equipment. For those who do not recognize the name, Royal is W9AIO, and he specifically requested the number from the telephone company.

In Puerto Rico recently, KP4AZ was heard by the wife of KP4RA—an ardent short-wave listener—calling KP4USA, Ramey Air Force Base, "blind," with emergency traffic. She alerted KP4USA by telephone. KP4USA got on the air and contacted KP4RA, and arrangements were made to dispatch an ambulance for a child needing immediate medical attention. A few days later, KP4RA worked KP4TO, a neighbor of KP4AZ, and told him of the incident. KP4TO replied, "Herman, that was our child and, until now, we didn't know whom to thank for making that telephone call."

According to the RSGB **Bulletin** for February, 1953, British amateurs stepped in the breach during the disastrous floods and storms that hit the coasts of England in late January and February. In many areas, all forms of communication except amateur radio were out of action for days on end. At least four distress calls from ships at sea were intercepted within a few hours by one group of amateurs.

The unusual part about this story is that a few years ago, the RSGB offered to organize an amateur disaster network, only to be told that the Postmaster-General (The British Licensing authority) could foresee no need for such a service.

The Dutch Amateur Radio Emergency Communications Service was also active in Holland during the same disaster.



It took W5CF, Fort Worth, Texas, five years to accumulate this unique collection of 103 QSL cards. He would like to arrange a two-way radio contact with other stations with call letters consisting of the same letter repeated so that he can add their cards to his collection.

Most people don't have to have a tree fall on them or know a "King" to become a Ham; however, under the proper circumstances, the combination is effective.

Alan Webb was fighting a forest fire in Nevada, when a burning tree fell on him. Other fire fighters saved his life, but Alan was slated for a long date with a hospital bed. That is how the tree got into the story.

"Queen For A Day," Mutual-Don Lee's famous "give-away" program brought the "King" into the picture, when they did a turnabout to elect a "King" For A Day."

Everett Wilson, a buddy of Alan's, secured tickets for the "all-male" broadcast and headed for the studios of KHJ in Hollywood. In the space on the ticket reserved for the purpose, Mr. Wilson wrote the story of Alan Webb, telling how Alan passed his time studying to realize his life-long ambition of becoming a radio amateur. Then he "wished" for a transmitter for Alan.

Mr. Wilson's unselfish wish and his sincerity in telling the story to Jack Bailey when interviewed over the air, made him the audience's choice as "King." Most of the engineers at KHJ are Hams; consequently, they were crowded around the monitors, following the program. When Mr. Wilson won, they all let out a yell. Bud Schultz, W6CG, Temple City, was the audio engineer for the show, and his war whoop nearly bounced the producer out of his headset.

E. F. Johnson, manufacturer of the famous *Viking II* transmitter, was on the phone as soon as the program was off the air with an offer of a *Viking II* for Alan Charles Forman, promotion manager for "Queen For A Day," made the arrangements to have the rig shipped to him at White Memorial Hospital in Los Angeles. Bud, W6CG, and other Hams in the Los Angeles area are seeing that Alan gets started off on the right foot.

So you see, it's not necessary to have a tree fall on you or to know a "King" in order to become a Ham—but it may help.



Everett Wilson's unusual wish not only earned him "King For A Day" honors but also secured a transmitter for a hospitalized buddy who wanted to be a Ham.



One of three complete amateur radio stations, operated under the call, VE3BRR/VE3, at The International Hobby Show in Toronto, during February. At the microphone is VE3NG, president of the Nortown Amateur Radio Club, sponsor of the exhibit. Standing are VE3RU, VE3BXF, VE3DGX, and VE3HZ.

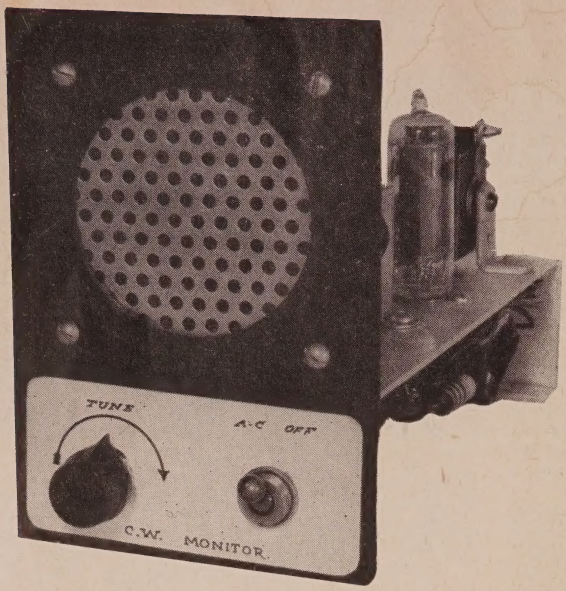
On January 15th, LUØMA climbed to the peak of Mount Aconcagua in the Andes carrying a one-watt phone transmitter with which he worked other Argentinean amateurs. This peak is over four miles high (7035 meters). Frequency of operation was in the 7-Mc. band. Best two-way DX was 290 kilometers, with heard reports from amateurs over 500 kilometers away. The LU gang thinks this may be the highest altitude from which an amateur station has ever operated "portable." Whether it is or not, it indicates that Hams are Hams the world over. Who else would climb a mountain with a complete radio station strapped on his back merely to make a few radio contacts?

"Unclassified Ad" in the March, 1953 issue of QRM, club paper of The North Suburban Radio Club (Chicago): "Must Sell: Same old junk advertised in last two issues. No suckers yet . . . W9JZN."

The response to the "revived" MONITORING POST has been very gratifying. Don't forget to send in items about Hams and their activities. We have found that newsy columns like the MONITORING POST are very well received and read with great interest. All-in-all they paint a different side to amateur radio operation while presenting a little added human interest. Contributions to: The MONITORING POST Editor, CQ, 67 West 44th Street, New York 36, N.Y.

Members of the Nortown Amateur Radio Club, of Toronto, Canada, operated three complete amateur stations as part of an Amateur Radio exhibit at The International Hobby Show held in Toronto between February sixth and fourteenth. Fifteen VE3's cooperated in the undertaking, and the three stations were in continuous operation during show hours, with two operators at each position.

Over 108,000 people attended the show, and 587 messages were handled by amateur radio. The radio exhibit was one of the most popular of the show, and it received much favorable publicity in all the Toronto papers.



RICHARD GRAHAM, W1VJV

7 New Street, Danbury, Conn.

A Novel CW Monitor

When the author sent in this article he naturally gave us the usual "sales talk." This monitor was different because it required no coil changing, it was simple and easy to construct and certainly just the thing that no station should be without. He sold us—we think he'll sell you too.—Editor.

The case for monitors needs no arguing. One need only realize the number of variables and interpretations involved in an exchange of quality reports to be convinced of their need around the shack. Relying on the other fellow's report of your signal is perhaps fine, so long as you're not interested in detail, for the fact still remains that such a report is second-hand. It is the result of his interpretation of what he thinks of your signal plus your interpretation of his report. Any resulting impression is often quite inaccurate.

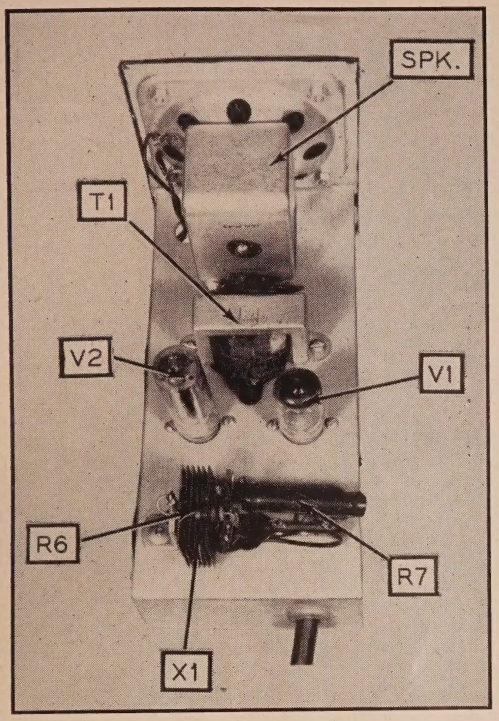
Monitoring CW is a more difficult proposition than monitoring a phone signal since some means must also be provided to modulate, as well as detect, the incoming carrier. The usual solution has been to use a regenerative detector which, of course, requires coil changing with each change of amateur band. This process, plus the very necessity of having a pile of coils around, can prove to be somewhat of a nuisance. The monitor described in this article is novel in that it does away with any coil changing or switching—a decided advantage for the multiband CW operator.

The Design

The principle of operation of this monitor might best be described as an untuned superhet with an audio frequency i-f channel. As confusing as this might sound, the circuit design and unit is quite simple, as attested to by the photographs and schematic diagram of the unit.

In use, the transmitter signal is fed into the control grid of the 12BE6 *(pin 7)* where it is mixed with an internal oscillator signal. This oscillator signal is at a frequency somewhere in the vicinity of 1000 kc., and is made variable over a small range by means of capacitor *C4*. Now, regardless of the incoming signal, the frequency of this oscillator can be slightly varied by *C4*, so that some harmonic will produce a detectable audio beat with the incoming transmitter signal. For example, if the transmitter is being keyed on a frequency of 4000 kc., then an oscillator frequency of 1000.125 kc. in the monitor will produce an audio beat of 500 cycles on the fourth oscillator harmonic. Other frequencies may be produced, such as the sum frequency of this harmonic as well as the sum and difference frequencies of the other oscillator harmonics, i.e., the third, sixth, etc., but these are all radio frequencies and as such are bypassed from the plate of the 12BE6 to ground through the 500 $\mu\mu$fd. capacitor *C5*.

However, the 500-cycle audio beat is unaffected



←A view from the top side showing the location of the principal components.

by this bypass condenser, and is fed into the grid of the 50B5 audio power amplifier. This tube then drives a small speaker.

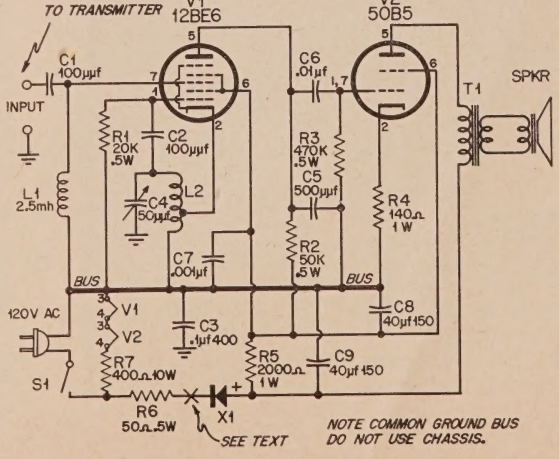
It is apparent from the foregoing discussion, that the frequency range of the monitor oscillator is quite small. One oscillator coil can cover all the amateur bands from 80 meters to 10 on its harmonics. To cover the 80-meter band, the oscillator should tune from 875 to 1000 kc. The other amateur bands will then be covered by a harmonic of some frequency in this range. For example, the 40-meter band at 7.0 Mc. is covered by the eighth harmonic of 875 kc., as well as the seventh harmonic of 1000 kc.; the other end of the band at 7300 kc. is covered by the eighth harmonic of 913 kc. This follows for all of the other bands. As the incoming transmitter signal is raised in frequency, you will find that there are an increasing number of spots on the tuning control dial where an audio beat is produced.

Actually, for ease and simplicity of construction the oscillator has a little more range than is necessary. The oscillator coil in this case was made from a four pie, 1.0 millihenry r-f choke on which the two end pies were removed. This reduced the measured inductance to approximately 0.5 mh. A centertap connection was made between the two remaining pies by *carefully* peeling the outer wire on one of the pies with a pair of tweezers. (The constructor can start with a 0.5 mh. choke that can be centertapped, if he wishes.) The wire was then cut in half. The two ends were stripped by pulling the wires through a piece of folded fine sandpaper. The modified choke was then mounted on a three-terminal strip as shown in the photograph.

The choke *L1*, acts as a low impedance to 60-cycle stray pickup. Otherwise, the monitor would also act as an audio amplifier. The cathode resistor, *R4*, for the 50B5, was not bypassed since experiments showed that only a very small increase in audio output was gained by including a capacitor across the cathode resistor.

To make the device as compact as possible, as well as economical, an a.c./d.c. type of construction was employed. A half-wave selenium rectifier serves to supply the d.c. requirements of the monitor satisfactory. A 2000-ohm resistor, *R5*, is used in place of a choke.

Since it is common house wiring practice to ground one side of the power line, no connection is made directly to the chassis, other than *C8*. The capacitor, *C8*, serves to ground the chassis and



Wiring schematic of the CW Monitor. The oscillator is set in the 1000-kc range and the harmonics beat with the signal in the Ham bands.

R1—20,000 ohms, 1/2w.
R2—50,000 ohms, 1/2w.
R3—470,000 ohms, 1/2w.
R4—140 ohms, 1w.
R5—2,000 ohms, 1w.
R6—50 ohms, 1/2w.
R7—400 ohms, 10w.
C1, C2—100 μμfd mica
C3—0.1 μfd., 400v.
C4—50 μμfd., variable
C5—500 μμfd., mica
C6—0.01 μfd., 400v.
C7—0.001 μfd. mica
C8, C9—Dual 40-40 μfd., 150v. electrolytic
L1—2.5 mh., r-f choke
L2—1.0 mh., 4 pie r-f choke, see text for modification.
X1—75-ma selenium rectifier
S1—s.p.s.t. switch
T1—output transformer
Speaker

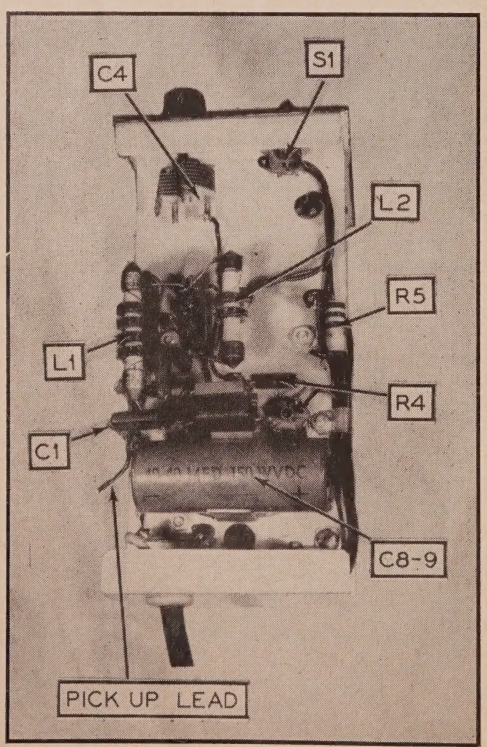
panel for r.f., but not for the power line frequencies. However, if you do feel a slight "tickle" when you touch the chassis, reverse the a-c plug polarity.

How To Use The Monitor

To use this device, it is only necessary to run a lead from the input terminal on the monitor to the transmitter r-f field. In some cases it is necessary to connect the chassis of both the monitor and rig to avoid a "watery" sounding note from the monitor. Thus, the monitor input lead can run parallel to the transmission line or close to the tank coil. The exact place can be best determined by the constructor since it depends largely on the transmitter, the construction and power output.

After the device is connected to the transmitter as described, rotate the tuning control, *C4*. A beat (or beats, depending on which amateur band is being used) will be heard. Simply adjust this control for the desired tone and that's that.

In some installations, the harmonics of the monitor oscillator may be heard in the station receiver, producing undesired beats with other signals. Whether this will be the case in your station depends largely on the installation; i.e., the proximity of the receiver and monitor, shielding, type of antenna transmission line, etc. The simplest solution, if this proves to be annoying, is to place a relay actuated by the standby-transmit switch at the point marked X on the diagram.



Under the chassis. The "pick-up lead" is varied in length and dress for the best sounding signal as well as r-f input.

While the unit described was made on a homemade chassis and panel, it can be easily rearranged to fit in a utility box, or perhaps that extra panel on the rig itself. The parts placement is not critical.

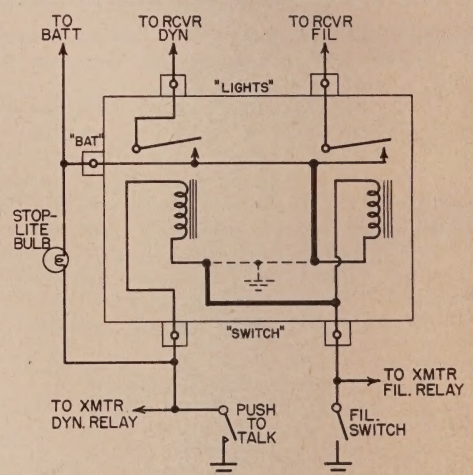
Construction of the unit should take no more than an evening, once the parts have been accumulated. Certainly it is one of those things that contribute to operating pleasure.

Inside the Shack and Workshop

Another Auto Relay Application

As pointed out by W6KAH (*Shack and Workshop*, May 1952, page 40) the relays sold as auto replacements are considerably less expensive than the equivalent commercial product and are made to order for mobile application. However, all the automotive standard relays are normally open. This is not much help especially for a receiver B+ control.

Shown in the diagram is one approach to answering this problem with a "headlight" relay. The dashed line is the part of circuit that is removed, while the heavy lines are the circuit additions. All of these wires are very easy to get at and the entire operation should take about five minutes to complete. The "stop light bulb" is a combination with a stop light



and tail light filament. Using the tail light section of the bulb lessens the battery drain on "transmit." It is a little slow on recovery and take about one-half second to reclose the relay.

The idea behind this operation is to have the "cold" filament pass plenty of current to operate the relay, but when the "transmit" switch is closed, shorting out the relay coil, the filament lights and presents a considerably higher resistance and less load on the battery circuit. When the "transmit" switch is released the filament cools very rapidly, lowering its resistance and closing the relay. It might also be pointed out that many of these relays have fuses in the light circuits (relay contact circuit) giving a ready-made filament and dynamotor fuse block.

Ed Tuck, WØERU

Ionospheric Propagation Conditions

Forecasts by GEORGE JACOBS, W2PAJ

144-40 72nd Ave., Flushing, New York

Beginning this month, this column will henceforth start off with a condensed, thumbnail description of DX possibilities on each of the amateur bands as follows:

6 Meters—Occasional single and double hop Sporadic E openings.
10 Meters—DX Very Poor—Frequent Sporadic E openings up to 1200 Miles.
15 Meters—DX Poor to Fair—very frequent Sporadic E openings up to 1200 miles.
20 Meters—DX Fair to Good.
40 Meters—DX Fair.
80 Meters—DX Poor to Fair, Band noisy.
160 Meters—Dx Very Poor, Band noisy.

This method of presentation should enable readers to get an overall picture of band conditions as well as indicating qualitative changes in each band from month to month. For specific times of band openings for any particular circuit refer, as usual, to the *Propagation Charts.*

During July and the summer months, there is a considerable increase in atmospheric noise levels in the United States. While the origin of atmospheric noise is not yet completely understood, it is generally known that the majority of atmospheric noise is due to thunder-storms. The atmospheric noise level at a particular location can be caused by both local and distant storms, with the noise impulses from the distant storms propagated to the location by the ionosphere, similar to the propagation of actual radio waves. A large majority of the world's thunderstorms occur in what is referred to as the equatorial weather front. In this area, thunderstorms are present for about 50% of the time. During the summer months, this weather front moves northward from the equator, and affects the distribution of noise in the Northern Hemisphere. Noise distribution charts appearing in the Bureau of Standards Circular 462, entitled "*Ionospheric Radio Propagation*" ($1.00 from the U. S. Government Printing Office, Washington 25, D. C.), indicates that this northward movement of the equatorial storm belt and the general increase in local thunder-storms throughout the United States results in a general atmospheric noise increase of at least 6 db. on 4, 7 and 14 megacycles from Winter values. In a general way this means that during the Summer months, signals have to be about twice as strong as they were during the Winter months to achieve a fixed signal to atmospheric noise ratio. Increased atmospheric noise levels will decrease DX possibilities, especially on the 40, 80 and 160 meter bands.

The Month of July exhibits generally stable ionospheric conditions. Periods during which good propagation conditions are expected will exist during July 2-5 and 16-25. Periods of subnormal conditions will appear during July 8-12 and 26-27.

Ionospheric Storminess

July is usually a month of relatively quiet ionospheric conditions. During 1952, July was the quietest month of the year, with a minor disturbance observed on but a single day of the entire month. The ionospheric disturbance forecast for this July appears in the usual space allotted to it in this column.

Readers of this column have often expressed the desire for knowing the accuracy of this column's ionospheric disturbance predictions. These forecasts of probable ionospherically disturbed days are based primarily upon the 27-day recurrence tendency of this type phenomena. This 27-day recurrence cycle is not by any means an established scientific fact, and quite often ionospheric storms will occur at times not associated with the cycle. On the other hand, an established series of 27-day recurrences does not continue indefinitely.

During the period, November 1, 1951 to March 31, 1953, significant ionospheric disturbances actually occurred on approximately 65% of the days predicted to be probably disturbed in this column. It has been fairly well established that the 27-day recurrence tendency becomes even more pronounced during the low period of the sunspot cycle. During the next few years, therefore, this method of predicting ionospheric disturbances may afford one of the most reliable means for long-range forecasting of this type phenomena. A good check on these long-range forecasts can be made by observing the short-term forecasts transmitted over the National Bureau of Standards radio station WWV. These short-term forecasts are prepared four times daily and consist of (1) Description of propagation conditions at time of issue—"N" for normal, "U" for unsettled, or "W" for disturbed; and (2) Forecast of the Average quality of conditions on North Atlantic transmission paths expected in the succeeding period of 12 hours; "1" for useless, "2" for very poor, "3" poor, "4" poor to fair, "5" fair, "6" fair to good, "7" good, "8" very good and "9" excellent. They are broadcast on WWV on frequencies of 2.5, 5, 10, 15, 20 and 25 mc., in International Morse Code at 19½ and 49½ minutes past each hour throughout the day. The times of issue are 0000, 0700, 1200 and 1800 EST with each forecast unchanged until the next one is issued.

Since unusual effects in long-distance radio transmission can result from ionospheric disturbances, it may be wise to again define an ionospheric disturbance. An ionospheric disturbance is usually defined as any abnormal deviations in the general characteristics of the ionosphere, such as abnormal height changes and reduced ionic density of the layers. When these abnormal conditions last for a period of many hours or several days they are called radio propagation or ionospheric disturbances. Typical effects of such disturbances are rapid fading, low signal strength and in some types, complete blackouts on the higher frequencies. In general, such disturbances have their greatest effect at night, especially in the pre-sunrise period. Radio disturbances also have their greatest effect on transmission along paths crossing the higher latitude auroral zones and their least effect, or none at all, on transmission across the equatorial zone.

Sporadic E

A considerable increase in Sporadic E or short-skip activity is usually observed during the summer months.

(Continued on page 69)

ALL TIMES IN E S T

EAST COAST TO: (Centered on Washington, D. C.)	15 Meters	20 Meters	40 Meters	80 Meters
Scandanavia	Nil	0700-1300 (2-3) 1300-1800 (3-4)	2000-0100 (1-2)	2100-0000 (1)
Great Britain & Western Europe	1500-1800 (0-1)	0600-1400 (3) 1400-1830 (4) 1830-2000 (2-3)	1900-0100 (3)	2000-0000 (2)
Balkans	Nil	0600-1300 (1-2) 1300-1600 (2) 1600-1930 (3)	1900-0000 (1-2)	2030-2330 (0-1)
Central Europe	Nil	0600-1400 (2-3) 1400-1830 (3-4) 1830-2030 (2)	2000-0000 (2-3)	2100-2330 (1-2)
Southern Europe & North Africa	1500-1800 (0-1)	0500-1400 (3-4) 1400-1900 (4) 1900-2030 (2)	1900-0030 (3)	2000-0000 (2)
Central Africa	1600-1900 (0-1)	0600-1200 (1) 1200-1500 (1-2) 1500-2100 (3)	1830-0000 (2)	1930-2330 (1)
South Africa	Nil	0600-1200 (0-1) 1200-1500 (1)	1930-0100 (1-2)	2030-0030 (1)
Near & Middle East	Nil	0600-1400 (0-1) 1400-1600 (1-2) 1600-1900 (2-3)	1930-2300 (1)	2030-2230 (0-1)
South America	1200-1900 (2-3)	0600-1600 (1-2) 1600-1800 (2-3) 1800-2200 (3-4) 2200-0100 (2-3)	1900-0430 (2-3)	2000-0400 (1)
Hawaii	1900-2100 (0-1)	0600-0830 (1) 1100-1900 (1-2) 1900-2300 (3)	2200-0730 (3)	0000-0500 (1-2)
Australasia	Nil	1700-2100 (0-1) 2100-2300 (1-2)	0000-0830 (2)	0130-0700 (1)
Guam & Pacific Islands	Nil	0700-1100 (2-3) 1500-2030 (0-1) 2030-2200 (2)	2330-0800 (2)	0100-0630 (1)
Japan	Nil	0700-1000 (2) 1500-2100 (0-1)	0130-0700 (0-1)	Nil
Philippine Islands & East Indies	Nil	0700-1000 (1) 1700-2000 (0-1)	Nil	Nil
India	Nil	0700-1400 (0-1) 1400-1600 (1)	1800-2000 (0-1)	Nil

ALL TIMES IN C S T

CENTRAL USA TO: (Centered on St. Louis, Mo.)	15 Meters	20 Meters	40 Meters	80 Meters
Great Britain & West Europe	Nil	0700-1400 (2) 1400-1700 (3-4) 1700-1900 (2)	1900-0000 (2)	2000-2300 (1)
Central Europe	Nil	0700-1400 (2) 1400-1700 (3) 1700-1930 (1-2)	1930-2300 (2)	2030-2230 (1)
Southern Europe & North Africa	1500-1700 (0-1)	0500-1300 (2-3) 1300-1630 (3-4) 1630-1830 (1-2)	1830-0030 (2-3)	1930-0000 (1-2)
Central Africa	1500-1800 (0-1)	0500-1300 (1) 1300-1500 (2) 1500-2000 (3)	1800-0030 (2)	1900-2300 (1)
South Africa	Nil	0500-1100 (0-1) 1100-1300 (1)	1830-0000 (1-2)	1930-2330 (1)
Central America & Northern South America	1400-1900 (2)	0600-1600 (3-4) 1600-2100 (4-5) 2100-0100 (2)	1700-0500 (4) 0500-0630 (2-3)	1800-0500 (2-3)
South America	1200-1500 (2-3) 1500-1900 (3-4) *	0500-0700 (3) 0700-1400 (2) 1400-2100 (4) 2100-0130 (2-3)	1830-0400 (3)	1930-0330)1-2)

ALL TIMES IN C S T

CENTRAL USA TO: (Centered on St. Louis, Mo.)	15 Meters	20 Meters	40 Meters	80 Meters
Hawaii	1900-2100 (0-1)	0930-1900 (2-3) 1900-2300 (3-4)	2200-0800 (3-4)	2300-0600 (3)
Australasia	1900-2200 (1)	0700-1000 (0-1) 1500-1930 (0-1) 1930-2130 (1-2) 2130-0000 (2-3)	2300-0700 (2-3)	0030-0600 (1-2)
Japan	Nil	0700-0930 (2) 1300-2100 (1) 2100-2300 (2)	0200-0600 (1)	0300-0500 (0-1)
India	Nil	1900-2100 (1) 0700-1400 (1)	Nil	Nil
Philippine Islands & East Indies	Nil	0700-1000 (1-2) 1000-2000 (0-1) 2000-2130 (1)	0400-0600 (0-1)	Nil

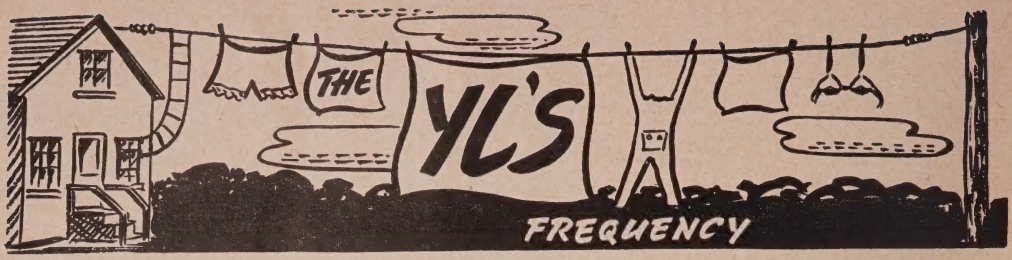
ALL TIMES IN P S T

WEST COAST TO: (Centered on Sacramento, Calif.)	15 Meters	20 Meters	40 Meters	80 Meters
Europe	Nil	0700-1400 (0-1) 1400-1700 (1)	1900-2130 (0-1)	Nil
South Africa	Nil	0600-1300 (0-1) 1300-1500 (1) 2100-2300 (1)	1830-2300 (1)	1900-2100 (0-1)
Central America & Northern South America	1500-1800 (1-2)	0600-1630 (3-4) 1630-2100 (4-5) 2100-2300 (1-2)	1900-0300 (4) 0300-0500 (2)	2000-0300 (2-3)
South America	1300-2000 (2-3)	0530-1500 (1-2) 1500-1700 (2-3) 1700-2100 (3-4) 2100-0100 (1-2)	1900-0230 (2-3)	2000-0200 (1-2)
Australia	1400-1900 (2) 1900-2130 (3)	1200-1930 (1) 1930-2130 (1-2) 2130-0000 (3)	2300-0500 (2-3)	0000-0400 (1-2)
Japan	2300-0200 (0-1)	1100-1900 (2) 1900-0200 (3-4) 0200-0500 (1)	0100-0500 (3)	0200-0400 (1-2)
Philippine Islands & East Indies	2000-2300 (1)	0700-1100 (2) 1100-2200 (0-1) 2200-0200 (1-2)	0300-0500 (0-1)	Nil
Malaya	2000-2300 (1)	0700-1000 (2) 1000-2300 (0-1) 2300-0200 (1)	Nil	Nil
Marshall Islands	1500-2000 (2-3) 2000-2300 (3-4)*	1000-1200 (2-3) 1200-1900 (2) 1900-0100 (3-4) 0100-0500 (2)	2300-0600 (3)	0000-0530 (2)
Guam & Marianna Islands	1300-1900 (0-1) 1900-2200 (1-2)	0700-0900 (2) 1100-2000 (2) 2000-0000 (3) 0000-0300 (1)	0100-0400 (2-3)	0130-0330 (1-2)
Hong Kong, Formosa & Macao	Nil	0700-0900 (2) 1200-2100 (1-2) 2100-0200 (2-3)	0300-0600 (1-2)	0330-0530 (0-1)
Siberia	Nil	1100-1800 (3) 1800-0000 (4) 0000-0300 (2)	0100-0430 (3)	0200-0400 (1-2)
India	1900-2100 (0-1)	0700-0900 (1) 0900-2000 (0-1) 2000-2300 (1-2)	Nil	Nil

Symbols For Expected Percentages of Days of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more.

* Indicates possible 10-meter opening.



Monitored by LOUISA B. SANDO, W5RZJ

959-C 24th St., Los Alamos, New Mexico

Congratulations to the officers of the Young Ladies' Radio League, newly elected for the 1953-54 term, who take office on July 1st. President; W1BCU, Margaret K. Wells, of Foxboro, Mass., who for the last two terms has been secretary-treasurer. Vice president: W2OWL, Ruth B. Siegelman, of New York City. Secretary-treasurer: W3UUG, Miriam V. Blackburn, of Ingomar, Pa.; for the past term editor of *YL Harmonics*. Publicity chairman: W3OQF, Barbara A. Houston, of Forest Heights, Md., who several years ago served as *Harmonics*' editor.

District Chairmen for the same term are:

W1OAK, Ann Chandler, RFD 2, Box 108, Barre, Vt.
W2EEO, Madeline Greenberg, 211 Willis Ave., N.Y. 54, N.Y.
W3SVY, Loreli Johnston, 224 Margery Ave., Pittsburgh 15, Pa.
W4JCR, Anita Calcagni Bien, Reynolds Mts. City Route 38, Asheville, N.C.
W5HWK, Jessie Harton, 1522 S. Polk St., Amarillo, Tex.
W6JMS, Lucille M. Hinkle, 4326 E. 55th St., Maywood, Calif.
W7HHH, Beatrice N. Austin, 1137 Federal St., Bend, Ore.
W8EIR, Kate B. Eastman, 520 W. Lake St., Alpena, Mich.
W9SEZ, Eleanor Engebretsen, 4303 N. Avers Ave., Chicago 18, Ill.
WØCXC, Mary Jo Overbeck, 1034-C Maple Lane, St. Louis 23, Ill.

Remember, these DC's will be looking for news from you for *Harmonics*. May YLRL have another good year ahead.

Hamfests

A Hamfest at Tyler, Texas, on April 19th, brought a turnout of seven YL's, who managed to get together at least long enough for this picture. Tyler, incidentally, has two YL's, W5YRT and W5VSN, and they're both named Maxine! The Hamfest was W5YRT's lucky day—Maxine not only walked off with a "man's prize" of a Heathkit grid-dip meter, but also a woman's prize, a lovely silver compact. The other Maxine, W5VSN, was "the voice" on the 10-meter hidden transmitter. They had the antenna inside a metal-roofed barn, just to make it more interesting. W5LGY, Helen, had the YL license that was the oldest so she received a jumbo (16 oz.) stick of candy. The youngest (newest) YL license



YLs at the Tyler, Texas, Hamfest in April. L. to r.: W5YRT, Maxine; W5LGY, Helen; W5RYX, Lyn; W5PYE, Dorothy; W5VBG, Dena; W5TKM, Clara, and W5VSN, Maxine. Photo by W5TXB.



KH6ADJ, Alice-May Drury, operating mobile. She is the only YL mobile out of about 35 mobile set-ups in the Territory. KH6ADJ has a Motorola police cruiser receiver, Gonset tri-band converter, home-built 28-watt transmitter and a 13½ ft. whip collapsible antenna.

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was held by W5VSN, so Maxine was given a baby rattle shaped like a mike.

The Fresno Hamfest on May 2nd brought together W6FEA, Gertie; W6JMS, Lucille; W6GQZ, Iva; W6GEV, Lois; W6KNJ, Betty; W6LFR, Marge; W6FKY, Eileen, and W6PJF, Rosemary. Rosemary says this is the first time so many active YL's have showed up for the Hamfest and that although this year nothing special was planned for them, next year they will schedule a YL meeting. W6JMS had the YLRL album for the girls to look at. (Don't forget, you can get this for Hamfests, etc., by writing to YLRL Publicity Chairman W3OQF.) Biggest thrill for the YL's was when W6KNJ, Betty, won the pre-registration prize—an Elmac transmitter.

Almost all the YL's attending the Hamfest are regular check-ins on the YL net on 3915 Wednesday mornings. Rosemary is net control and says they are one swell bunch. Regulars include W6FEA, HTS, JMS, PVV, LFR, NLM, WRT, KER, QGX, CEE, LFY, DCL, UHA, with W6QGZ, WTN, ZYD, GEV and others joining when they can. She also reports an OM, W6DCL, who is so persistent in checking in that they've nicknamed him "Molly"—hi!

"Young Lady" at Sixty-Seven

They say it's never too late to learn—read on, and once and for all you can believe it. W4NUB, Anna Loys Hand, earned her Ham ticket at the age of 67. That was a Class C in 1949. Last year she passed the General Class, and now in her 70th year she is still going strong!

Anna Loys had learned Morse code many years ago as a girl of 15 or 16. At the time her brother helped another boy at the railway depot and thereby learned the code. Then the two boys helped her learn it and set up a line between their houses so they could talk at will. But Anna Loys' family moved away, she married, had six children and forgot all about Morse code. But her two oldest sons became interested in radio and had the first receiver in the whole area. Finally, son Edwin became W4FNW, and it was through his urging that Anna Loys got her ticket.

It all started when Edwin moved some hundred miles from the family home at Bay Minette, Alabama. He urged his father to become a Ham so they could have regular contacts. But the elder Hand thought the idea was ridiculous "for a man of my age to become a Ham." Not so Anna Loys. With her son's help she learned the code, though she says, "it was more a case of his coming when he could and mostly it was a matter of hard work—keeping at it myself every day—like going to school." Finally, she bought an Instructograph and tapes, and her husband helped by checking copy for her.

Delighted when she passed the exam, he bought her a TBS-50 transmitter, power supply, S4OA receiver, and a 3-element beam for 10 meters. They also put up a 35-ft. wire for 75 meters. Now Anna's OM wishes he had taken up radio himself and declares "it was a good case when a man should have been listening instead of talking!"

Anna Loys does have another hobby that she shares with her nan-Ham husband—that's growing lots of Japonicas, Camellias and Azaleas.

W4NUB's routine starts with getting up at 5:15 a.m. for a 5:30 daily schedule with her son Edwin, W4FNW, to let him know his mother and dad are all right. Much of her other operating is done as three-way contacts with herself, her son, and other Hams. In this fashion Anna Loys has worked England, Germany, South America, Puerto Rico, and the Canal Zone.

Are you convinced? Surely, here's proof that any gal, young or not so young, can become a radio amateur if she works at it hard enough.

SK

On April 11th, W7HJI, OM of Beth, W7NJS, was stricken with a fatal heart attack. Just two days later Irma, W7OVW, lost her OM, W7BMG, the same way. Bea, W7HHH, telling us of this double tragedy adds, "For two of our 75-meter net girls to have this tragic experience in so short a time is something that I hope we never again experience. I know that I express the wishes of all of you girls when I extend our deepest sympathy to them in their hour of sorrow."

KH6 YL's

KH6AFL, Luika, of the Hawaiian YL's, reports that it's rather discouraging to try to keep their club together — that about as soon as YL's get licenses they take off for the mainland again. KH6AQK, Marie, went to Alaska. KH6AOO, Lee, went back to New York, where Del, KH6TI, is also living. And about five gals who got their Novice licenses left afterwards. The club is still going, though; they meet on the last Thursday of each month either at members' homes or at restaurants. One member, KH6AJD, Alice-May, recently had an FB write-up and a photo of her mobile set-up in the **Honolulu Star-Bulletin.**

33 es CUL—W5RZJ.



W4NUB, Anna Loys Hand, left, enjoying a personal QSO with W4UPJ/KZ5LM, Lois Magner.

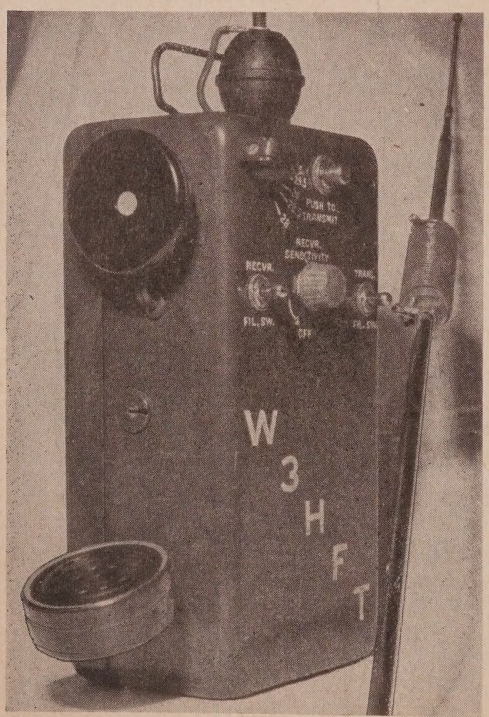
A Ten-Meter "Handy-Talkie"

STEPHEN J. LUISSER, W3HFT

Electric Center, 1756 Main St., Northampton, Penn.

Efficient operation in disaster areas should not presuppose the availability or practicability of the family car. The use of this relatively simple and inexpensive unit will insure peak efficiency of your communications group under the worst emergency conditions.—Editor

If you're interested in building a handy-talkie, you'll find this one about the simplest of those yet published. It all started when a few months ago, the board of directors of the *Delaware-Lehigh Amateur Radio Club* came to a rude awakening and realized that although the club was fairly well equipped with mobile and fixed stations, there was not a single piece of equipment that could be easily carrier beyond the point where roads ended. If there were to be an actual emergency it would be almost impossible to get right on the spot quickly.



The complete unit, which is 9" high. The center-loaded antenna is a modified telescoping car whip.

The Board therefore decided that the building of handy-talkies was to be the next club project. A contest was started; each member was to use his own ingenuity, and the best one would receive a prize offered by a local radio parts distributor. The requirements set forth by the club were: (1), that it would receive and transmit over at least a one-mile radius; (2), the receiver should not radiate on the operating frequency, (3), it would have to be rain proof and tamper proof and, (4), that it be easily portable and preferably a self-contained unit.

After reading over all the available published material on handy-talkies, the author came to the conclusion that none would quite fill the bill. Either they were too difficult to build and required too many specialized parts, or the transmitting radius way way beyond the one mile required while some were too complicated to be operated by the ordinary Ham. The club wanted a unit that, in time of emergency, they could hand to any available Ham and, with the minimum of instructions, have them used effectively.

The Design

I started out by rummaging through the local department stores looking for a box into which I could build a portable unit. Finally, I came up with a small metal tool box 3¼" x 4¼" x 9" tall. It had a lock on it which would make it certainly tamper proof and fairly rain proof. After I saw how much space the batteries would take I decided that the whole outfit could use no more than two tubes, a 6AK5 for receiving and another for transmitting. The use of 6.3-volt tubes in a handy-talkie may sound a little ridiculous, but not, however, after all the facts are considered. Usually, they are more rugged than one-volt tubes and secondly, they exhibit higher gain. The 6AK5 is a small tube and very easy to handle electronically, and above all we could use the 6.3 volts for the microphone circuit and get sufficient modulation without a modulator stage.

The receiver is very basic. It consists of merely a one tube employing grid detection and a controlled amount of regeneration. No difficulty should be

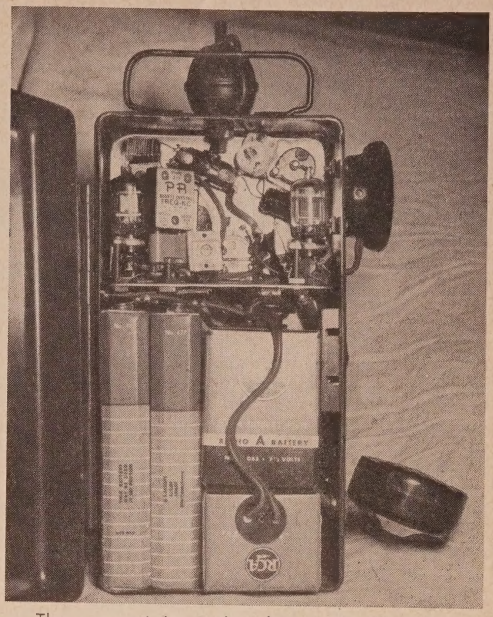
Coil Winding Data

L1—Cathode coil, 8 turns #22 en. closewound on 9/16" dia. form.
L2—Plate coil, 14 turns #20 en. closewound on 9/16" dia. form.
L3—Antenna link 4 turns #22 en. closewound over L2.
L4—Grid coil, 16 turns #20 en. closewound on 9/16" dia. form.
L5—Feedback coil, 4 turns #22 en. closewound over L3.
L6—Antenna pick up link, 5 turns #20 en. closewound on 3/8" dia. form.

encountered in this department. The only unusual thing about the regeneration control is its adjustable mechanical stop, which prevents accidental over-advancing, thus causing oscillation which interferes with nearby receivers. This is simply accomplished by mounting a stop pin on the front panel of the handy-talkie, and using a bar knob on the regeneration control. To adjust, remove the regeneration control knob and advance the control to a point just before oscillation takes place; then put on the bar knob so that the bar on the knob rests against the stop pin. This simple expedient will preclude the possibility of receiver oscillation.

Be sure to keep all receiver leads short and ground *pins 2* and *7*, both sides of the cathode in the 6AK5. Use a pen-cell *Eveready #915* as a coil form for coil *L3*, and a pen-cell *Eveready #912* for *L1*. Wind all coils in the same direction.

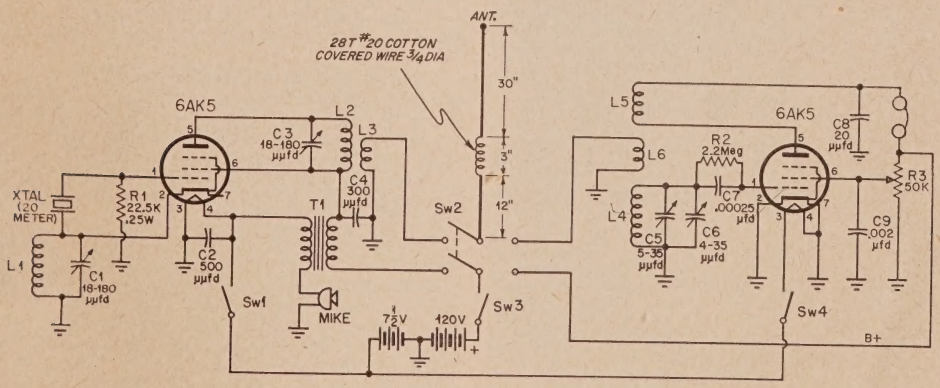
As far as the transmitter is concerned, it is simply a conventional tri-tet, doubling in the plate circuit. Probably the only unusual thing is the modulator circuit. This consists of nothing more



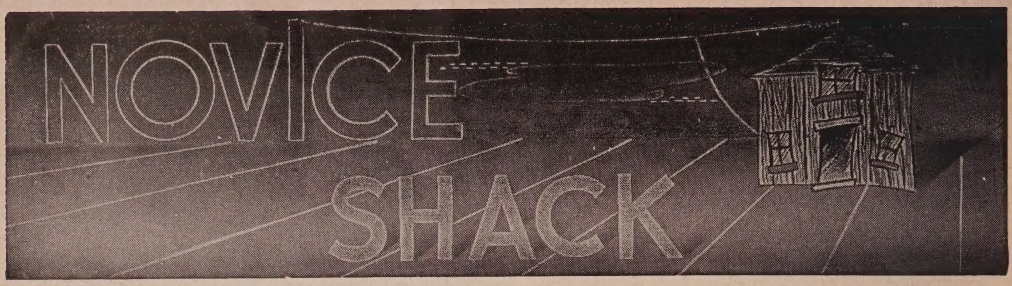
The compact transceiver layout. Modulation is applied by the carbon mike and transformer across the 6.3 volt "A" supply.

than an ordinary carbon mike transformer. Considering that the total input to the plate of the 6AK5 final is only in the neighborhood of one-half watt, it can be easily seen that adequate modulation will take place with the carbon mike and transformer across the 6.3-volt "A" supply. A regular F1 carbon mike unit is used. In the transmitter,

(Continued on page 57)



R1—22,500 ohm, 1/2w.
R2—2.2 megohms
R3—50,000 ohm potentiometer
C1, C3—18-180 μμfd. mica padder
C2—500 μμfd.
C4—300 μμfd.
C5—5-35 μμfd. variable air
C6—4-35 μμfd. variable ceramic
C7—250 μμfd. mica
C8—20 μμfd.
C9—.002 μfd mica
Sw1—filament and mike switch for transmitter
Sw2—d.p.d.t. push to talk switch
Sw3—switch on sensitivity control
Sw4—receiver filament switch
T1—carbon microphone transformer
Battery—(2) "B", 67½v., Eveready 477 (2) "A", 7½v., Eveready 717



Conducted by HERB BRIER, W9EGQ

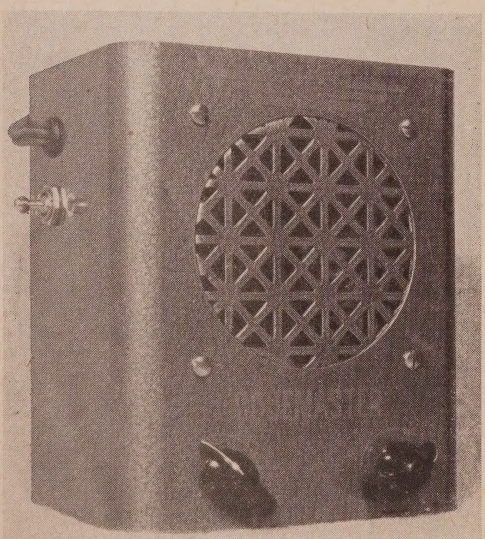
385 Johnson St., Gary 3, Ind.

A code practice oscillator of some kind is a virtual necessity in learning the code. And after a license has been obtained, a keying monitor is necessary to send really good code on the air. Pictured on this page is the *Bud CPO 128 "Codemaster"*, which satisfies both requirements.

Basically, the "Codemaster" is an audio oscillator feeding a built-in loudspeaker. It operates from 115-volt, a-c/d-c house current. One-half of a 12SN7GT twin-triode tube is used in the oscillator. The other half serves as a ½-wave recifier in the power supply for the oscillator.

Both a tone control and a volume control are provided on the unit. Tone is adjustable from a low-pitched growl to a shrill whistle. Volume is adjustable from zero level to a level sufficient to be easily audible all over the average house. A jack is also provided for headphone operation.

The manufacturer claims that the output of the *CPO 128* is sufficient to operate up to twenty pairs of phones. I did not test the accuracy of this statement directly, but I can assure you that it is quite a stirring experience to be wearing a pair of phones plugged into it when some joker twists the volume wide open and presses the key!*



The Bud CPO 128 combination code practice oscillator and keying monitor reviewed on these pages. The unit sells, complete with built-in speaker, for approximately $14.00.

Keying is excellent. Neither key clicks or chirps are in evidence. In fact, the signal from the unit sounds just like a well-keyed, crystal-controlled transmitter does when tuned in on a good receiver—minus the interference and background noise.

The CPO 128 Used As A Monitor

To use the *CPO 128* as a code monitor, a d.p.d.t. toggle switch on the side of the case is snapped. This disconnects the 115-volt power line from the rectifier circuit and automatically substitutes a pick-up link. This link consists of a length of twin-conductor, insulated, flexible cord, terminated in a two-turn coil. The coil is coupled to the tank coil in the transmitter, to pick up a small amount of r.f. This power is then rectified and filtered to supply voltage to operate the oscillator.

Keying the transmitter thus keys the monitor, because it interrupts the audio oscillator plate voltage. The big advantage of this type of monitor is that, once adjusted, it is not necessary to keep fiddling with it each time one shifts frequency in the band, which is necessary with a conventional monitor, or when the receiver is used as a keying monitor. It does have one disadvantage, however. Because the r.f. picked up to operate the oscillator is rectified and filtered before being used, it gives no indication of the quality of the signal emitted from the transmitter.

Although only a very small amount of r.f. is required to operate the monitor, it may be difficult to obtain this through the two-turn coupling coil from a very low-powered transmitter. For example, I could not obtain sufficient voltage to operate it from a 3.7-Mc transmitter with 120 volts on the plate of the output tube, no matter how closely I coupled the pickup loop to the tank coil.

Another low-powered transmitter, using a 1625 with 300 volts in the output stage, operated the *CPO 128* without difficulty, although the volume was less than when the power was obtained from the power line. Power output from the transmitter decreased a just preceptable amount when the pick-up loop was coupled to the tank coil.

Undoubtedly, the first transmitter had sufficient output to operate the monitor. The two-turn pick-up coil just did not provide enough coupling. A larger coupling coil or a tuned one would increase power sensitivity when necessary.

* The foregoing discussion applies only to low impedance earphones.

In a transmitter that is well shielded against TVI, it may be mechanically difficult to introduce the coupling into the final amplifier enclosure. Besides, the external conductor to the *CPO 128* may allow harmonics to escape, thereby partially nullifying the effectiveness of the shielding. Fortunately, the r.f. may be obtained from any point in the transmitter carrying keyed, r-f voltage of sufficient amplitude.

If the transmitter uses an antenna tuner, coupling the pickup loop to its coil will virtually eliminate the possibility of increased TVI. Also, there is seldom any d-c voltage on an antenna tuner. The shock hazard is therefore greatly decreased.

Another way of operating the monitor from a shielded transmitter requires a slight modification in it. Unsolder the pickup link from the changeover switch on the *CPO 128*. Solder a 2.5-mh. r-f choke across the switch terminals and a pickup antenna to the "hot" one (determined by experiment). The length of the antenna and its position are then varied until an audio signal of the desired strength is obtained from the speaker. For this system to work, there must be a certain amount of r.f. around the shack; otherwise, the pickup antenna will have to be inconveniently long to obtain sufficient voltage to operate the monitor.

Last, but not least, the *CPO 128* may also be used as a phone monitor by plugging a pair of phones into the key jack.

Letters and General News

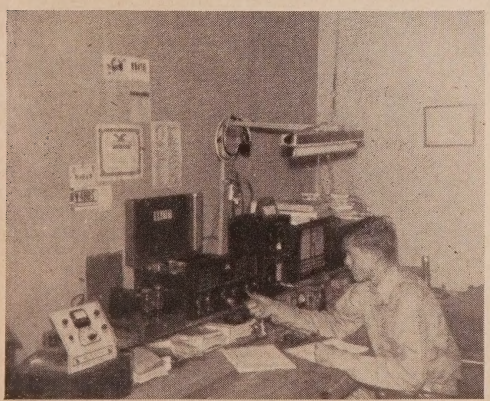
Jerry, WN6SQN, writes, "Dear Herb, Today at five p.m., I worked Hawaii on the 3.7-Mc. Novice band with my ten-watt rig. I do not know if that is a record, but I think it is pretty good DX for such low power during the daylight hours.

"In the nine months that I have been on the air with my ten watter, I have worked twenty-three states. I think that the fellows with low power can do just as well as the high-power boys, if they are patient and take advantage of the good conditions when they come along.

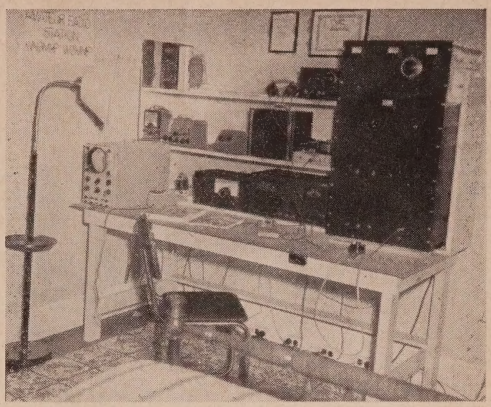
"I am sixteen years old and am a Sophomore in high school. My pal, KN6AMW, is a Sophomore at the same school. I am now waiting for my General Class license. 73"—Jerry, WN6SQN.

Frank, WN7THH, writes from Gabbs, Nevada, "Dear Herb, I finally got my Novice call after waiting a good three months. So far, the number of contacts have been small, but I have hopes, and I plan to get my General Class license in the fall.

"My transmitter is an adaptation of the "Foolproof Novice Transmitter," described in the January, 1952, CQ, using a 6AG7 oscillator and a 1625 amplifier, with fifty watts output. Receivers are an old **S20R** and a new **SX-71**. Present antenna is a folded dipole.



David Langley, of Aurorar, N. C., at the controls of WN4YDY. The transmitter is a Harvey-Wells Deluxe, with fifty watts input on the 3.7-Mc. band. The receiver is an SX-71. Dave made his first contact last Christmas day.



146-Mc. station, WNØMNP, operated by Ronald Tipton, 16, in Kansas City, Missouri. The transmitter at the right uses a pair of 815's in the final. Receiving is done with an S-76 receiver and a home-built converter. Also visible on the left side of the bench are cathode-ray oscilloscope, vacuum-tube voltmeter, signal generator and grid-dip oscillator. Ronald's latest acquisition is a fifty-foot tower upon which he is erecting a rotary beam.

"My pet 'beef' about the Novice band is the number of fast operators on it. Seems like a newcomer just has to wait for a slow-speed man to get on the air. I can say one thing. There must be a million Novices working the 3.7-Mc band! 73"—Frank, WN7THH.

Sam Popkin writes from Lockbourne AFB, Columbus, Ohio. "Dear Herb, I just finished your article on getting the most from a receiver in the April, 1953, **Novice Shack**. I have a new S-76; have had it since January. Herb, that receiver really sounds a lot better now, since I've been following your advice for setting it up. I see you really have something there.

"I have received my notice from the Commission that I'll soon have my Novice ticket as a WN2. The home QTH is Wingdale, N. Y. Well, 73 now. Keep up the good work in the **Novice Shack**"—Sam.

T. D. Foster, WN4YAA, writes from Korea. "Dear Herb, I thought I would let you know about a Ham's inactivity in this part of the world. I am completely isolated on top of a mountain, operatng a v-h-f relay station. We don't have to worry about TVI, but we do have a type of interference not likely to be found in the States. It is 'Crow-roosting interference.' The beam antenna rotates easily when a crow lights on it. The only cure I have discovered is an M-1 rifle. The only trouble is that I shot one element off the antenna this morning!

"Last October, I received my Novice license. I managed to operate on week-ends for about three months before going overseas, but my license will expire before I get back to the States. 'There ought to be a law!' Luckily, my Technician Class license will still be good, next year, listen for me on the VHF's from Spartansburg, S. C.

"I have scrounged up enough parts to build a code-practice oscillator. I was successful in infecting a buddy with the Ham radio bug, and he hopes to get his license some day.

"Please print my address, in case some Hams in the States would like to write to me. I would like to hear from any of them. 73"—Pvt. T. D. Foster, US 53114224, R & M Co., 101st Sig. Bn., APO 264, C/O Postmaster, San Francisco, Calif.

Rog, W9UZP, writes, "Dear Herb, I had the N knocked out of my call and am now operating all bands with fifty watts. I want to take this opportunity to invite any and all amateurs planning to attend the National Boy Scout Jamboree in California in July to locate me and pay me a visit. I might be operating portable, so look for a 'whip' on a sand hill. 73"—Rog, W9UZP.

From a long letter from Jim, KN2AZA, entitled "The



KN2CHS, Scarsdale, N.Y. The first Novice station to report successful DX work on the 21-Mc Novice band. Using a 7-Mc antenna, Dave Smith, the operator, worked five DX countries, including the extremely rare ZD9AA, with fifty watts input. Details in text.

Private Life of KN2AZA," I quote: "Dear Herb, I follow the **Novice Shack** quite closely, and here is my two cents' worth on the topics of recent discussion. I feel quite qualified to answer the question of 'cheap receivers' discouraging Novices, because I first owned an **S-38B** and now have a used **HQ-129X.** I used the **S-38** for several months and had a lot of fun with it. If I had had the money, of course, I would have started out with a more-expensive one, but I don't think the **Novice** is discouraged by the lack of **Collins,** etc., equipment.

"I find a lot of fellows hesitate to ask a station to QRS (send slower), and thus sometimes ruin an entire QSO. It's no great sin to request a QRS. After all, we are all beginners. The only 'sin' involved is when a station has been asked to send slower and then gradually goes back to the original speed.

"When a station calls CQ fifty times without signing, the operator is usually a fellow who has just got on the air and is getting a little exasperated when no contacts result immediately. This practice is usually dropped when he gets a little experience. For example, I heard WN9??? calling CQ. First he sent CQ fifty-two times without signing, then forty-eight times, and then thirty-six times. That's progress, hi.

"My transmitter is an **HT-17** with an input of between fourteen and twenty-three watts. The antenna is an end-fed, 80-meter, half wave, fed with a length of old 300-ohm ribbon. It is thirteen feet high on one end and twenty-seven feet high on the other. With this layout, I have had about 700 QSO's with stations in forty-three states, VE3 and VE7. I just recently went on 7 Mc., and now have twenty-eight states on that band. 73"—Jim, KN2AZA.

Dave, KN2CHS, shows what can be done on the 21-Mc Novice band when conditions are right. "Dear Herb, Tuesday, April 7th, I got on 21 Mc, and I believe that I have made some Novice 'firsts' in the DX field. I worked ZD9AA, Tristan Da Cunha, Africa, at 1007 EST; F8BW, France, at 1130; and 9S4AX, Saarland, at 1318. On the 8th, I worked PY2LM, Brazil, at 1711; and on the 13th, I worked PJ2AA, Netherlands, West Indies, at 1553.

"My transmitter is a **Harvey Wells TBS-50D,** the receiver is an **HQ-129X,** and the antenna is a 7-Mc. folded dipole, pointed north and south. I am fourteen years old and a Freshman in high school. 73"—Dave KN2CHS.

Dead-Letter Office

Speaking-of-coincidences department: A few weeks ago, I received a QSL card, addressed to WN5YAQ. Malcolm Swan, Fort Worth, Texas. Some one had crossed out the address and substituted 430 Johnson St., Gary, Ind. Many of the local Post Office employees know that I am a Ham, therefore, when they get a QSL card they cannot deliver, they frequently forward it to me. As a result, I was not too surprised to get the card, although I was at a loss to understand why it was in Gary, instead of Fort Worth.

That evening, a young lady called me up and asked if it would be possible for her to talk to her husband who was in the Air Force and stationed at Limestone, Maine, over my station. A schedule was set up, which resulted in a successful contact between K1FCF, Limestone, Me., and W9EGQ on 7-Mc. 'phone. A few days later, I received a card from Limestone, Me., thanking me for the schedule. It was signed "Mac," Malcolm B. Swan, WN5YAQ!

While on the subject of QSL cards, Fred Sawyer, W9FJI, of Evansville, Indiana, calls attention to the necessity for a complete address on a card. He points out that "A QSL card addressed to W9XXX, Chief Operator John, Evansville, Indiana, certainly is not properly addressed. How many people in a city of approximately 150,000 are named John? And who but a fellow Ham would know who W9XXX was? Certainly not the Post Office—Congress hasn't allowed them any money to buy Call Books. Even if it did, it takes six months sometimes to get a new call in the book."

The moral of this story is clear. If a QSL card is properly addressed, the odds are overwhelmingly in favor of it being delivered. Otherwise, it will probably end up in the Dead Letter Office, unless it has a three-cent stamp and a legible return address. Under these circumstances, it may be returned to the sender.

Fred also has another project under way. He collects unwanted **CQ's, QST's,** and, I presume, other radio magazines, to send to overseas Hams. Fred's address is: Fred Sawyer, W9FJI, 627 East Virginia St., Evansville 11, Indiana.

Jerry, K2CLA/3, writes from Washington, D. C., "Dear Herb, that space-saving vertical antenna described by WN8KQW in the April **Novice Shack** looks like one I can use so that the landlady will get off my already aching back."

Jim, W1TYV, says, "Dear Herb, I had had my Novice ticket several weeks when I finally decided to get on the air 'by hook or crook.' I got a **BC-454** receiver and built a two-watt rig. Being anxious to try it out, I tossed about forty feet of wire over the roof and attached it to the transmitter.

"Well sir, I never changed that antenna in the remainder of my Novice days. Best DX was 400 miles in broad daylight. I had any number of solid QSO's with stations within a 100-mile radius—some over an hour long. This on 3.7 Mc! 73"—Jim, W1TYV.

Ronald, WN4BYF, describes a midget 3.7-Mc. antenna. While its theoretical efficiency is low, his results may interest other Novices in trying it. He writes, "Dear Herb, I know what it is not to have much room for an antenna, so, after I got up one sixty-four feet long, I threw together a small one **(Fig. 1),** and it worked about as well as the big one.

"To build the antenna, I straightened out a wire coat hanger and cut off a piece two feet long. I inserted the end of this piece in the top of a plastic soap box. Then I close wound 500 turns of wire obtained from the secondary of an old transformer on a 11/16-inch diameter



Ward Helms, 14, at the key of WN7SXM. His transmitter runs fifteen watts to a 6V6 and his receiver is a BC-454. Best DX on 3.7 Mc. is 1000 miles.

form. Then I slid this form over the wire and rested it on the plastic box and connected one end of the winding to bottom of the two-foot vertical and the other end to my antenna tuner. The tuner consists of a **B & W JVL 80** tuned by a 100-$\mu\mu$fd., variable condenser, link coupled to the output stage of my 45-watt transmitter. I set this combination on my mantle, which is four feet high, and called CQ. My first one raised a station 140 miles away. Time, 6:00 p.m., frequency, 3729 Kc. 73"—Ronald, WN4BYF.

The following lads would appreciate help in obtaining their Novice Licenses:

Harry Woodcock, 4161 Linden Ave., Deer Park 36, Ohio.

Bobby Shepherd (15) 610 So. Washington St., College Park, Ga.

D. A. Wells, 3415 W. 78th St., Los Angeles 43, Calif.

Jim, WN9WWJ, decided that there wasn't enough news about Wisconsin in the Novice Shack; so he did something about it. Result: two letters received. In one month as a Novice, Jim has made 137 contacts in fourteen states, twelve confirmed. His transmitter is a **Philmore NT-200**, twenty-five watts input, and his receiver is a **Hallicrafters S-77.**

Jim thinks "The Hams that help us Novices to get started should get some sort of credit. The one that helped me almost 100 per cent of his spare time was W9RHU, who is my neighbor. I am helping my friend get his Novice ticket now." In his next letter, Jim wrote that his friend was waiting for his license, and another one was getting ready to take the examination.

Cliff, WN4ZEL, writes, "Dear Herb, I was surprised to see WN4YRF's letter in the **Novice Shack**. My first contact was also with W4UUF! My rig is a 6L6 with twenty watts input, and the receiver is an **S40B.**

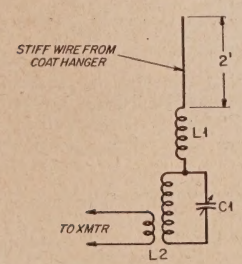
"Would you please print a request for any Novices interested in forming a Gulf Coast Novice Net to write to either WN4RYF or myself? 73"—Cliff (age 13), WN4ZFL, 17 North "E" St., Pensacola, Fla.

Dave, W2GHS, says, "Hello Herb. No, I'm not a Novice and never have been, but I have a suggestion to pass along to the Novice gang in regard to their trouble with QRM (interference).

"Why not try one of the **Surplus FL-8** audio filters? For CW work, they really do the trick. Connected between the receiver output and the phones, it will pass only a single audio frequency, 1020 cycles. The switch on the filter should be set to the 'Range' position. A slight drop in output will be noticed when the filter is in use, but it is not enough to matter. 73"—Dave, W2GHS.

Grover, WN4YZX, writes for himself and his brother, Berry, WN4YZY. He writes, "Dear Herb, Enclosed is a picture of my brother and me at our station. We share the same receiver and transmitter. Sometimes it is hard to wait until the other fellow gets through with a QSO so we may get a chance, but we get along pretty well.

"The receiver is an **SX-43.** We went in together and bought it. The transmitter uses a 6J5 and an 807, with



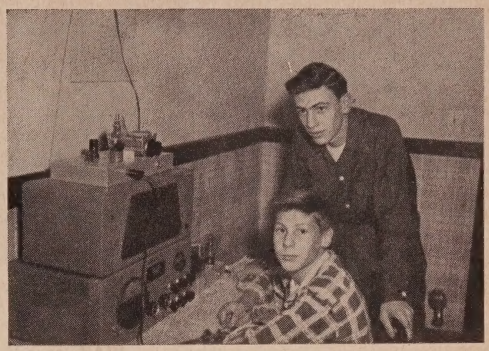
C1-100$\mu\mu$fd VARIABLE
L1-500T CLOSE WOUND #16 DIA-WIRE SALVAGED FROM SECONDARY OF OLD POWER TRANSFORMER
L2-B&W JVL 80, OR 30T #18 ON 1 1/2 DIA FORM WITH 3-TURN LINK AROUND CENTER

C1—100 μfd. variable

L1—500 turns close wound 11/16" dia. Salvaged from secondary of old power transformer.

L2—B&W JVL 80, or 30 turns #18 on 1½" dia. form with 3-turn link around center.

Fig. 1. The midget 3.7-Mc antenna developed by WN4BYF, and described in the accompanying text.



Grover (standing) and Berry Cobb, and their neat, jointly owned Novice station in Atlanta, Georgia. Grover, who is 18, signs WN4YZY. About thirty-five states have been worked with forty-five watts input to the transmitter. Photo credit: Mitchell-Atlanta.

about forty-five watts input. It is not only home constructed; it is also home designed. We have doublet antennas on 40 and 80 meters. Together, we have seventeen confirmed states, and that many unconfirmed.

"My gripe is the people who persist in staying on W1AW's frequency while code practice is on. Looks like some people should have a little courtesy! Oh yes, I am eighteen years old, and Berry is thirteen. 73"—Grover Cobb, WN4YZX.

A historical note to conclude the **Novice Shack** this month. The Novice Class license was authorized just two years ago this **July.**

See you next month. Keep writing.

73, Herb, W9EGQ

Inside the Shack and Workshop

Absorbent Headphone Cushions

The soreness that long wearing of headphones so often causes to the ears of radio operators is due in a considerable measure to irritation from perspiration. A sheet of ordinary cleansing tissue folded once and placed between the receiver and the ear has a soft cushioning effect, provides a continually clean and sanitary surface, and absorbs the moisture formed by perspiration condensation on the receiver cap. If the cushioning effect of the shield is not sufficient, several layers may be placed between the receiver cap and the ear; but if more than two thicknesses are used, an opening should be provided in the center of the shield to permit good sound transmission. The shields may be fastened to the receivers by rubber bands.

Charles Felstead, KH6CU

Plugging Panel Holes

Old or used panels with holes that will not line up with the new equipment may be plugged in the following manner:

Lay the panel flat over a flat surface and melt solder into the hole flowing it over the hole. Hammer this lump of solder into the hole so as to force it in good and tight. Smooth the solder down with sandpaper or file. Refinish the panel with a coat of paint. Holes up to ½" have been filled using this method. If the panel is painted with a crackle finish, it is impossible to detect the filled holes.

Thomas C. Jensen, W8TIC



Gathered by DICK SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands, U.S.A.

There being no new additions to WAZ or the HONOR ROLL this month let us take a look into the activities of the Frog Hollow ARC, a meeting of which is now in session, "Cautious" Jones presiding.

A word might be said here regarding the Jones "prefix". This was acquired after a very brief but highly unpleasant encounter with 800 volts. Now "Cautious" runs eight 807's in PP/Par. with 300 volts and tunes the rig with a plastic rod three feet long. Any approach to within less than three feet of the rig interrupts some light cells which cause various things to happen, the most noticeable being the clamor of a gong and the wail of a small siren accompanied by a background of clacking relays. It has been said that "Cautious" dons linemans gloves when changing his flashlight batteries but this has not been verified.

The first item on the agenda dealt with the negative results obtained to a proposal of the "Frustrated DX-men's" Committee. These members had sworn not to work any station over 100 miles away and, for this purpose, had originated the call "CQ XD". It seems that so many ZD8's and VQ6's had invariably answered this call that practically no contacts had been made. Inversely, some rebel hazarding a "CQ DX" was rewarded with dead silence.

The second item met with unanimous approval. This was the adoption of the Q signal "QXX," meaning, "You — !!@%#**-&"#—!!!." This was to be directed solely at the numerous 5 KW DX-ers who insist on working the same rare DX station 79 times.



Here is where the well-known signal of GM3CSM originates. Ian Hamilton, Glasgow, is shown above in operating position. Present standing: 39 zones and 186 countries.

The third item was presented by "Tank Coil" McMash, whose copper tubing plate coils were highly adaptable and successfully used in another line of endeavor. Mac offered a jug of Triple X Frog Hollow Swamp Juice to any member who would submit workable abbreviations for the words "Appreciate" and "Incidentally."

All business being concluded the members departed to their respective "shacks" after a silent nod to a plaque bearing the following inscription:

Here's to the memory of Henry McShott,
Hank was grounded. The chassis was not.

At Time of Writing

EASTER ISLAND, CEØAA: The latest word we have on this trip is that Luis, CE3AG, was slated to have sailed from Valparaiso around June 5th, and would spend from four to six days at CEØAA starting between June 15th and June 20th. We hope this expedition is now an accomplished fact and that you have all nabbed him. See QTH's.

CRETE, SVØWP: A phone QSO between G3ID and SVØWP tells us that SVØWP was scheduled to have been active in Crete between May 16th and May 20th.

LIECHTENSTEIN, HB1AG/HE: This station was very active during the first two weeks in May. Herman QSO'ed many on 3.5, 7 and 14 Mc. See QTH's.

CHRISTMAS ISLAND, ZC3AA: From VK6MK we hear that this station, originally scheduled to open up on April 26th, has been delayed a bit. ZC3AA's departure from Australia should now have taken place about May 15th.

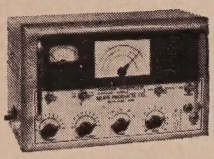
SULTANATE OF OMAN, VS9AD: Dave was unable to obtain plane space for a scheduled trip to this QTH on April 28th but he did make it on May 13th as confirmed by QSO's with W4CEN and KV4AA. Further trips are probable.

BRITISH SOMALILAND, VS9AP/VQ6: Van made a brief visit to VQ6 on April 28th, 0530/0730 GMT, Conditions were low and only six QSO's were completed. Further trips to this QTH are planned this Summer and a better rig will be used. Van also plans to set

(Continued on page 54)

25th ANNIVERSARY YEAR

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ELMAC A54

Under-dash Mobile Xmtr.

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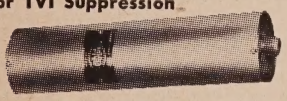
Covers 10, 20, 40 and 75 meter bands.

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Power Supply, 110 volts AC,	39.50

HARVEY-WELLS Bandmaster Model TBS50

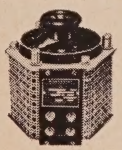
Senior Model..... $111.50
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VFO for above $47.50

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A 4-section filter with less than .2% insertion loss providing harmonic attenuation in excess of 75db. Adjusts for maximum attenuation between Channels 2 and 6. Has 44 Mc cutoff. Handles 1 kw, fully modulated. Employs Teflon insulation, and is equipped with SO-239 connectors. Impedance: 52 ohms. Dimensions: 2½" diam., 10" long $16.50

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Smooth, efficient voltage control, 0-135 volts output from 115 volt AC line. Models also for 230 volt input. Write for free literature. Models for table and panel mounting.

Type 10, 1,25 amps	$ 8.50
20, 3 amps	12.50
116, 7.5 amps, table mtg.	23.00
116U, 7.5 amps, panel mtg.	18.00
1126, 15 amps	46.00
1156, 45 amps	118.00

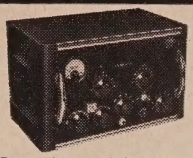
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NOTE: In view of the rapidly changing market conditions, all prices shown are subject to change without notice and are Net, F. O. B., New York City.



SONAR Model SRT-120 Transmitter

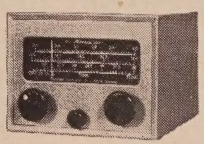
For mobile and fixed location operation. Has band-switch for 80, 75, 40, 20, 15, and 10 or 11 meters, plus spare position for any future band. Has provision for two crystals or external VFO head. Final amplifier employs the new Amperex 9903/5894A tube. Power input is 120 watts on CW, and 100 watts on phone. All circuits metered. Power requirements: 600 volts dc at 350 ma, and 6.3 volts at 6 A.

Complete with Tubes..... $198.50
External VFO Head..... 19.50

SRT-120P same as SRT-120 but with built in push-to-talk relay and self-contained power supply for use with 110-125 v. 50-60 cycle line..... $279.50

Also available in Kit Form:
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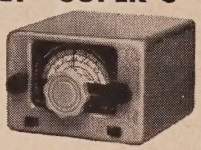
Covers 540 kcs to 40 mcs, with illuminated calibrated bandspread scales for 80, 40, 20, and 10 meter bands. Has tuned RF stage, two IF stages, and two high fidelity audio stages, with phono input and tone control provided with built-in speaker, antenna trimmer, high frequency oscillator, gain control, noise limitor, AVC, headphone jack, and send-receiver switch.

Complete with tubes **$119.95**

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Six Band Amateur Converter



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Needing no introduction is Julio Badin of CX1FY, Colonia, Uruguay. The neat station layout is shown above.

up show on Kameran Island some time in July and a trip to Qatar is a possibility.

QATAR: Via GM6MD we are advised that GM3AFG, ex-MP4BAO, will soon operate from Qatar. GM3AFG has been doing far too much traveling to send out cards for old MP4BAO contacts but promises to do so when set up in Qatar. Other possibilities are MP4BAU, on 7 and 14 Mc., when Adi gets his new rig finished. OK1MB reports MP4BAM on phone each Monday, 14130. G3CHN advises that MP4 call signs are being taken care of so that the first letter following the numeral will signify the QTH, i.e. K for Kuwait, B for Bahrein Is. and Q for Qatar.

RIO DE ORO: PY2CK reports that EA4BH (EA9BH?) is on from this QTH each week-end, 14100 CW. It is also reported that W6NMC A3 will pay a brief visit to this spot shortly, signing EA9NMC.

COCOS ISLAND, ZC2/VK1: Besides VK1HM, VK1BJ is now active on Cocos. A QSO has been noted with PY2CK on 14200 A3. G5RV has now sent out over 300 ZC2MAC/ZC2AB QSL's so all should have them by now, barring delays at Bureaus.

COCOS ISLAND, TI9: W6UXX was unable to visit this QTH during recent fishing trip but prospects look brighter during his next voyage which should leave California around June 15th.

VIRGIN ISLANDS, KV4: The additional of KV4BD who runs a KW on phone, 14 and 21 Mcs, augments KV4BB's A3 activities and should make KV4 phone contacts much easier.

FORMOSA, C3: C3BF has been active on 14005/14045 kcs., 0500/0900 GMT, to give many a much wanted contact with this QTH. QSL's should go to W1WAY.

MACQUARIE ISLAND, VK1: This spot has been actively represented through the efforts of Scott, VK1AF 14070; Brian, VK1BA 14015 and Russ, VK1RL 14010. We have been told the last two use the same rig. QSL's may go via the W.I.A. Australia.

BRITISH NORTH BORNEO, ZC5: Hugh, ZC5VS, continues his activity on 14078, 1400/1700 GMT with the main beneficiaries being W6's and Europeans.

MONACO, 3A2: (Via West Gulf Bulletin) G6LX/3A2AY will journey to Monaco accompanied by G3BZL/YI3BZL and G4QK. They will be on the air from July 10th to July 20th with a 35/40 watt phone/CW rig. A Vee beam on W is planned and a 21-Mc ground plane antenna will be set up. 7, 14 and 21 Mc. will be used.

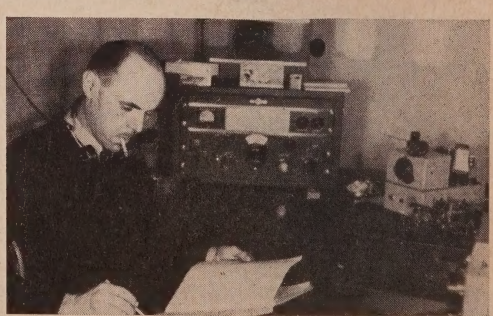
IWO JIMA, KAØ: (Via W5FXN) Larry, KAØIJ, will wind up operations and return stateside about June 10th. He hails from Corpus Christi, Texas, but has no W call as yet.

DX in General

LB8YB is located on MYGGBUKTA Island. 100 miles off the Greenland coast. This island is, presumably, owned by Norway. QSL's go via the N.R.R.L. . . . **YU1AD** reiterates that there are just no ZA stations on the air. We have in mind several phone contacts recently reported with one ZA1F/ZA2F . . . **OK1MB** reports a new MP4 in the "Sheikdom of Bubai" with call letters, as yet, unknown. Beda also advises that **MP4BBL** may be heard on 7007 kc. starting around 2200 GMT . . . 9S4AX advises that **LZ1KSA** is QRV each Saturday on 14020 at 1700 GMT . . . From F9RS we hear that ex-FQ8AE arrived in Noumea on April 13th and will be active on 7 and 14 Mc. with the call of **FK8AO.** See QTH's . . . **PX1C** was nabbed by VK5HI, A3, 14150 . . . **LB1CB** is a LA portable call operating from the Island of Aalesund off the west coast of Norway. Counts same as LA . . . F9RS announces the additions of **FI8AK** and **FI8AL** to the FI8 gang and advises the use of 7 Mc. is prohibited in FI8 land. Further info on FI8 comes from W2PFB who recently visited FI8AD. Wen says that FI8AG and FI8AH have now left Viet Nam and other FI8's QRT as follows: FI8AC May '53; FI8AA, FI8AB and FI8AJ June '53; FI8AD Oct. '53; FI8AF Jan. '54; FI8AE, a new arrival, April '55. All QSL's go to Box 527, Viet Nam . . .

G6BS passes word that Egyptian Nationals are again being licensed as evidenced by SU1MR on 14 Mc. A3. See QTH's. SU CW activity is ably furnished by **SU1HS, SU1SS, SU1XZ, SU1GG and SU1GB** . . . A total of 58 LU-Z calls have been issued for Argentine Antarctica as of April '53. These include two Mobile calls, **LUØZDJ** and **LUØZDV.** All QSL's go via Radio Club of Argentina. Meade, **TA3MP,** advises his station may be found daily, from 0600 to 1600 GMT, on A3, near 14,348 or 14,125. Plenty of CW operation is also planned in the vicinity of 14,085 kc. Sunday operation is, at times, limited. TA3MP will be in operation for another year plus a possible additional year. Meade begs for SHORT calls. See QTH's . . . From the So. Calif. DX Bulletin we hear that **PR3WI** is a new station supposed to be active on Washington Island. Same country as VR3. QSL's go via KH6YP . . . OH2YV advises that Finland will soon get a new district, OH9, which will be in Northern Finland above the Arctic circle. Present activity there is from **OH8OC** and **OH8OG** . . . **OY3IGO** is active on 14054 kc . . . From SM5LL we learn that **3A2AW** was active in Monaco, 14050 CW, 14300 phone, from May 9th to May 21st. QSL's go to SM5ARP . . . **HR1AT** promises

(Continued on page 56)



Shown above is one of Ham radio's dependables, Beda Micka of OK1MB, Prague, Czecho-Slovakia. Here Beda relaxes a minute to catch up with some log entries.



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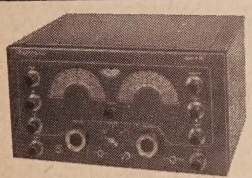
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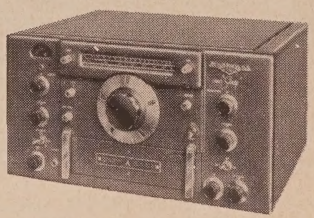
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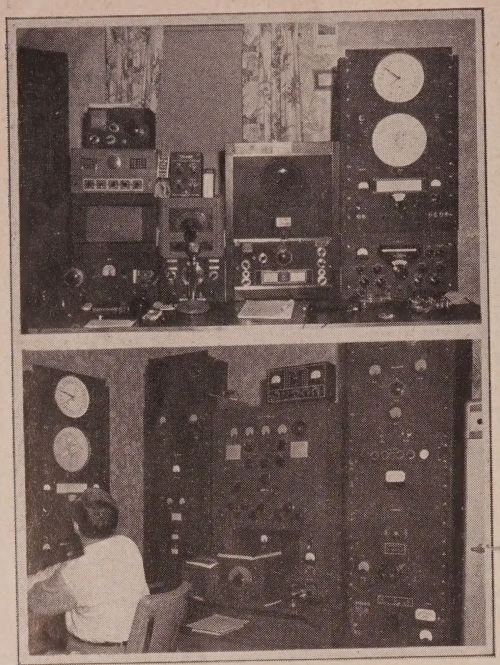
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Above are two views of W8PQQ, Saint Albans, W. Va., with Al Hix at the throttle. PP-304TL and PP-250TH finals are used and modulated by 810's in Class B. Antennas are center-fed doublets on 3.5, 7 and 21 Mc., and 3-element rotary beams on 14 and 28. Al is also well known for his DX activities at 7B4QF, PX1AR, F7AR and 3A2AC.

to be more active with the new 813 rig . . . **ZK1BG** is active, 14012 0420 **GMT**, which fills the void left by ZK1BC . . .PAØKW reports hearing a QSO between **4X4AO** and **HL8BX!!**

Exploits

W9FKC upped to 206 with OD5AD, FR7ZA and VS9AS while W6MHB brought his list up to date with such as OY2Z, ZD6HN, CR6CZ, ZD2DCP, CR4AC and FB8BB to land on 195 . . . **VK4EL** rose to 182 with MP4BBE, OD5AB, VP5EM, F9QV/FC and FB8BB . . . **4X4RE** eased up to 218 with VP8AU, KJ6AX and VS9AW while **W9LNM** is just behind with 217 courtesy of OD5XX, SU1SS and VK1RL . . . **W6BUD** now has 202 with the addition of ZC4IP, MI3LK, ZB2I, FB8BB and VP2SH . . . **W1ZL** reaches and passes the 200 circle with OD5LC and VK1BA giving Carl 201 . . . **W2HMJ** went to 203 with OD5BH while **ZL1QW** added Zone 37 for 37 Zones and 138 countries with the addition of MI3LK, FI8AB, PJ2AD and VS9AP . . . Burt, **KG4AF**, goes to 182 with VS9AP and SVØWG . . . **W1RAN**, Ned, upped to 143 with VS9AP and ST2GL while **I1ER**, Mario, added Zone 2 and ZS9G, VS7NG, 3V8AB, CN2AD, VQ2DR and KG4AF to stand at 35-112 . . . **G8IG** nabbed CR4AI for 177 on phone and **W3BES** swelled his phone total to 189 with ZD9AA on 21 Mc . . . Miles, **W6ZZ**, went to 129 with the addition of ZP5DC on 21 A3 . . . Lou, W9ESQ, raised his 7-Mc DX to 114 with such as VP2SH, KG4AU, HR1KS, VK9YY, CT1UI and ZL3JQ . . . Ev. **KP4KD**, made it 197 with VS9AP on 21 Mc . . . **4X4RE** added a nice one on 3.5, VP8AP . . . **W2WWP** snagged KW6BB on 7010 for his No. 104 on 7 Mc.

W9HUZ nabbed VS9AP for a new one . . . **WØYXO** latched on to ZC5VS . . . CPIBX idled to 53 with SU1GG, GG uses a 300-foot vertical, balloon hoisted . . . **KV4BB** ran up 176,080 points in the recent phone brawl. Could be tops! . . . **W2DKF** received the USKA's "Friendship Award" with assist from HB9MQ and HB9NP . . . **OZ7HT** nabbed KV4AA for No. 102 . . . **SM4UJ** was No. 99 for W2QHH on 7 Mc . . . **KH6ARA** reached 99 with OK1MB, HB9X, ON4AU and 9S4AX . . . **ZL3JA** snagged VK1AF on 3.5 A3 . . . **W4ZAE** upped to 62 on 7 Mc. with YV5EW and VP8AJ . . . **W8YIN** reports LB9IC on Andenes Island. Same as LA . . . **W1JOJ** recd QSL from VK1DC, Heard Island. This station had only two or three contacts during his stay. **YU1AD** grabbed ZC5VS for No. 197. Mirko is up to 69 on 3.5 Mc. with MI3AB and VS9AP . . . **W2MOJ** nabbed OD5XX, 14030. XX says to QSL via OD5AD . . . **G2MI** hooked VP1AA for No. 199 . . . **VP2SH** was 131 for W5AVF . . . We can now raise **KH6ARA**, just mentioned, to an even 100 with SP3AK . . . **W3AS** made it 112 confirmed when ZD7A's QSL arrived. George also sports WACE certificate No. 449 . . . **W4CEN** received RSGB Certificate for high W scorer for the '51 European DX contest. W1RY was second . . . **W5UUK**, a newcomer, now has 37 countries with KV4, CX and ZK1 . . . **OE1CD** comes up to date with 15 additions to put him on 211 . . . **KP4KD** adds a 'last minute' VQ3BM on 21 for No. 198 . . . **KV4AA** was a 'first' for W7RUK, ZL1CH and VK3AKV . . . **VK2ACX** rose to 226 when Art knocked off ZS2MI, VS9AW and VK1BJ (Cocos) . . .

160 Meters

This band refuses to die, according to W2WWP, who has been working ZL1WW, 1903, between 0900 and 0930 GMT in broad daylight. Clark suggests that calling and listening periods be instituted for ZL's during April/May, which seems to be the best time of year for these stations. We concur. What say Stew? W2WWP advises ZL3RD is also active 1905/1907 and many ZL phone carriers have been heard.

21 Mc.

This band went mad a couple of times since our last report. Sunday, May 3rd, was a day with Europeans pounding in from 1500 GMT right up to 2300 GMT (to the Caribbean area). Twenty countries were worked here; LU, OA, TI, DL, FF, W, G, VS9, I, OZ, TF, KH6, HB, LA, F, EA, PY, PAØ, OH2 and SM . . . Phone has added a great impetus towards DXCC on this band with A3 activity being reported from such countries as HK, HR, PJ, ZP, KG4, KV4, HP, VR2, ZL, KM6, CR4, VQ5, 5A2, ZD1, ZD9 and SV. On CW, VU, AP, ZD2, VS1, ST2 and MP4B—have been heard . . . **KZ5IL** worked VS9AP and completed WAC . . . **TI2TG** went to 68 with SU1HS, HK4DF and VK9GW . . . **W4KRR** hooked ZP9AY for No. 62 . . . **OA4ED** has 32 while G3AJP nabbed PJ2AD for 34 . . . **9S4AX** has 35 and worked first Novice, KN2CHS . . . **G3GUM** went to 76 with such as SP6FK, MP4BBD and ZD2JDH. Neil say stations should call every 15 minutes as too many are just listening which give the appearance of a dead band when things are really OK . . . **W6VX** ups to 50 with GM8MN, VP4LZ, CX1KB, PJ2AA and ZD9AA . . . **W3AYS** hit 65 with HC1FS, CX1GG and ZP5DC, all A3 . . . **W5VIR** worked FU8AA, 21025 CW, for No. 40 . . . **W6ZZ** goes to 42 with ZP5DC HK4DF and KM6BG, all A3. Miles needs Nevada to complete WAS . . . **PY4RJ** reports 24 zones and 60 countries on A3 . . . **LU6AX** has 36 . . . **OH2OP** went to 45 with KV4AA . . . **KP4KD** rose to 55 with VS9AP and VQ3BM . . .

21-Mc. Standings

G6ZO	**76**	**G6GN**	**62**	**G5BZ**	**55**
G3GUM	**76**	**W4KRR**	**62**	**G2BJY**	**55**
DL7AA	**72**	**G8II**	**61**	**WØHVN**	**55**
DL7AP	**70**	**PY4RJ**	**60**	**KP4KD**	**55**
DL3RM	**70**	**PAØKW**	**57**	**KV4AA**	**55**
TI2TG	**68**	**FA8IH**	**57**	**W1RY**	**54**
W4COK	**66**	**W2WZ**	**56**	**DL3BJ**	**53**
W3AYS	**65**	**G6QB**	**56**	**DL7BA**	**52**
W1BUX	**62**	**G2VD**	**55**	**OZ2PA**	**52**

Please keep us informed of your 21 Mc standings.

Here And There

John, **VP8AP**, pulled the big switch on April 20th, after an auspicious stay in the South Orkney and Falkland Islands. He should show up from GM3EYP or from a QTH near Liverpool shortly . . . W1JOJ, W1 QSL Mgr. wrote to EA8AW offering to distribute **EA9DC** QSL's . . . **MI3AB** needs QSL's from XE1A, XE1DA or XE1CQ to complete WAZ. How about a little help? . . . Burt, **KG4AF**, shuts up shop on June 1st, and will probably be heard from W4-land very soon . . . **W6DFY** gave an interesting talk on his travels to KP4 and KV4 during a So. Calif. DX gang get-together on May 7th . . . Clay, ex-F7BA, now ops from **W2DPM/3** . . . **G8IG** hopes that UA regulations will relax enough for him to collect his Zone 18 QSL for WAZ on phone . . . **G3FPQ** is off

(Continued on page 58)



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DX NEWS

(from page 56)

to VE land for eight months flying training . . . **W2WZ** is busy rebuilding at present. Al plans a 7-Mc ground plane antenna . . . **W1FH** is putting up a new steel tower which will support stacked 21 and 28-Mc rotaries . . . Ron, W2SUC/SVØAB, now pounds brass at **DL4CC** . . . **I1AMU** and **I1KDB** nabbed one ZD8D on 14 A3, 1730 GMT . . . Brian **G3GX** is spending a year at **VP9GX** . . . **ZS8MK** left for England on May 8th. He returns in September to ZS8 or ZS7 . . . W8HEV/8 is printing QSL's for **FM7WD.** 7WD, Ned, says he will QSL direct . . . G3IGZ reports hearing **VS9MQ** on 020 at 1900 GMT. Might be a new one in the Maldives . . . Pat, KH6ARA (W2AIS ex-ZC8PM), returns to New York around June 30th. He plans to take another crack at shipboard operating . . . **F7BS** is ex-W7MIC . . . Old **CP1BK** is now reported in N.J. . . . W9FFV is now **W4FFV** . . . YU1AD received a visit from **SM5UH** who is DX Editor of SM-QTC Mag. . . . To those not in the know Air Letters may be obtained at your local P.O. These may be sent to any place in the World for ten cents which represents a considerable savings over the twenty-five cent rate. Nothing may be enclosed but your call may be stamped or printed on them . . . **VP5BH,** Cayman Is., 7003, needs So. Dak. for **WAS** . . . **W2ESO** advises us that the VOA Ham Program has been discontinued due to new VOA policy whereby English language programs are cut way down.

Honor Roll Endorsements

VK2ACX	**40-226**	**W2HMJ**	**38-203**
OE1CD	**40-211**	**ZL1QW**	**37-138**
W6BUD	**40-202**	**KG4AF**	**35-182**
W6MHB	**40-195**	**W1RAN**	**35-143**
VK4EL	**40-182**	**W6ZZ**	**35-129**
4X4RE	**39-218**	**I1ER**	**35-112**
W9LNM	**39-217**		
W9FKC	**39-206**	**PHONE ONLY**	
W1ZL	**39-201**	**G8IG**	**39-177**
KP4KD	**39-198**	**W3BES**	**37-189**

Last complete HONOR ROLL appeared in the June Issue.

Next complete HONOR ROLL will appear in the September Issue.

WØVDC sports a new 3-element wide-spaced beam on 14 . . . **VP8AJ** QSL's left in April. Next lot will be sent from G3AXN when VP8AJ QRT's next June . . . **OE13RN** returns stateside in August . . . The new Finnish Club Station, **OH1AA,** is now on the air . . . **4X4RE** still awaits QSL from KB6AF, QSO'd in Nov. '51. Any help? . . . In May column we stated that W5ESQ held WACO (Cuban) Certificate No. 61. This should have read "W9ESQ". Sorry Lou! . . . **K2CLA/3** reports that activity from Johnson Island, **KJ6,** will be practically nil unless new operators are shipped in to replace KJ6AW, QRT last December and KJ6AX who was scheduled for transfer in May . . . ex-DL4LQ should be on the air now, from Independence, Kansas, with new WØ call. 35 watts VFO . . . "Pi", **VQ4DO,** says it's pretty rough living in Nairobi these days. He keeps a loaded 45 QRV right next to the electronic bug!! . . . Jim, **GM3NH,** moves to Canada and hopes to be on with a VE2 or VE3 call shortly. G3AGQ also heads for VE-land where he will be heard from VE7 . . . **VS1AY** is back in Singapore after a year in the States . . . G5RV vacationed in Portugal in May . . . **W6AM** has completed his 1550-foot rhombic. It's headed 16 degrees east of North . . . KG4AF reports **LB5ZC** active in Spitzbergen, no time/frequency given . . . Mac, ex-VP8AD is now **LU5AD** . . . **KZ5EM** is a new Ham in C.Z. See QTH's . . . **KZ5KG** is old W2MFR while **KZ5FI** pounded brass at W5FIV . . . LA4ZC advises that **LB6XD** returns to Norway during last of July and will QSL 100% . . . The Barnsley and District Amateur Radio Club, Barnsley, Yorks. England, celebrates its 40th Anniversary during the period from Sept. 12th to 20th. Contacts with any of the following members at that time will result in a **Special Coronation Commemorative** QSL card. G's 2AFV, 2BH, 3ABS, 3AMH, 3DHU, 3DOI, 3EAE, 3FLQ, 3GAH, 3GKK, 3GNK, 3GXB, 3HTM, 3YA, 4JJ, 5IV, 5KM, 6LZ, 6UF and 8VX . . . **KM6BG** is **W6INQ.** Ross is due to

return to Calif. these days . . . By the time this is read all QSL's from **CP1BX** should be on their way. Ted wishes to thank KZ5CP, KZ5FI and Sully, KZ5BS, for their help in obtaining gear and QSL cards during his recent visit to KZ5'land.

Antarctic Argentine Certificate, CAA

The Radio Club of Argentina offers this certificate upon proof of contact with one station in Argentine Antarctica. (LU-Z). Stickers are available which may be affixed to the Certificate to cover contacts with each Antarctic Detachment, Base, Village, etc. 1953 activities cover the following spots:

1. South Orkney Islands—Laurie Island. (LU-ZA, LU-ZG, LU-ZM)
2. South Shetland Islands—Deception Island. (LU-ZC, LU-ZI, LU-ZO)
3. Palmer Islands—Observatory Island. (LU-ZB, LU-ZH, LU-ZN)
4. Grahamland—Gen. San Martin Base. (LU-ZD, LU-ZJ, LU-ZP)
5. Grahamland—Punta Proa. (LU-ZE, LU-ZQ)
6. Grahamland—Bahia Esperanza. (LU-ZF)
7. South Shetland Islands—Bahia Luna. (LU-ZS)
8. Mobile Stations LUØZDJ and LUØZDV.

Last Minute Items

ZK1BG, Doug, is presently rockbound on 14012, 0300/0800 GMT, but will obtain another xtl from ZK1AA shortly . . . Doug, **ZK1AB**, may be found near 14032 kc. . . . Hugh, **ZK1AI**, visited Noumea and was expected to see FO8AI . . . ZK1BG will QSL 100% via ZL2LB Bureau. See QTH's . . . W5DML advises that ZL1FT (ex-ZM6AK) has ample supplies of **ZM6AK** cards if any are missing . . . WØELA says all **VS5ELA** cards have been sent out . . . W6YY reports that Fung, **VS6CG**, will be glad to QSY to phone any time asked . . . From W5FFW via KH6WU we hear that **VR4AE** is active on 14-Mc. CW each day 0500/0700 GMT . . . **W5VSS** returned to West Coast May 2nd after attaining DXCC at the Tulsa QTH.

Certificato Del Mediterraneo

Another new colorful certificate is being offered by the A.R.I. (Associazione Radiotecnica Italiano), Via S. Paolo 10, Milano, Italy. To any station who can show proof of contact with 22 of the 25 Mediterranean Countries plus 30 of the 79 Italian penisular Provinces as listed below.

QSL's need not be sent if letter is submitted containing all QSO data and countersigned by the Secretary of any Radio Association affiliated with the I.A.R.U. All contacts should date AFTER June 1st, 1952. Three IRC's should accompany each application. The CDM will be issued for either CW or Phone.

MEDITERRANEAN COUNTRIES

EA Spain	IT Sicily	YU Yugoslavia
EA6 Balearic Is.	OD5 Lebanon	ZA Albania
EA9 Sp. Morocco	SU Egypt	ZB1 Malta
F France	SV Greece	ZB2 Gibraltar
FA Algeria	SV5	ZC4 Cyprus
FC Corsica	Dodecanese Is.	3A2 Monaco
I/AG2/MF2	SV Crete	3V8 Tunis
Trieste	TA Turkey	4X4 Israel
IS Sardenia	YK Syria	5A1/2/3 Libya

Alessandria	Aosta	Arezzo	Treviso
Ascoli Piceno	Avellino	Belluno	Verona
Benevento	Bologna	Brescia	Pisa
Brindisi	Caserta	Chieti	Savona
Como	Reggio Emilia	Ferrara	Teramo
Firenze	Cremona	Genova	Udine
Gorizia	Forli	Lecce	Vicenza
Livorno	Imperia	Novara	Pistoia
Matera	Macerata	Pesaro	Rieti
Padova	Modena	Pescara	Siena
Ancona	Massa Carrara	Ravenna	Terni
Asti	Pavia	Rovigo	Varese
Bergamo	Reggio Calabria	Spezia	Viterbo
Campobasso	Aquila	Trento	Potenza
Cosenza	Bari	Vercelli	Roma
Foggia	Bolzano	Piacenza	Sondrio
Grosseto	Catanzaro	Mantova	Torino
Lucca	Cuneo	Napoli	Venezia
Milano	Frosinone	Salerno	Perugia
Parma	Latina	Taranto	

Latest QSL Addresses

C3BF (Formosa) Via WIWAY

(Continued on next page)

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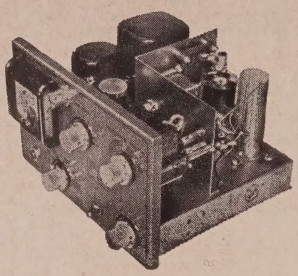
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(from page 59)

CEØAA (Easter Is.)	Via CE3AG, Casilla 761, Santiago, Chile.
CR4AD	Sal Island Airport, Cape Verde Is.
HB1OT/UR	Via U.S.K.A. Switzerland.
HB1AG/HE	Herman, Box 97, Schaan, Liechtenstein.
HE1C	Hal Stelzer, Tellstrasse 22, Vaduz, Liechtenstein.
HH2FL	Box 153, Port-au-Prince, Haiti.
HH3DM	Box 943, Port-au-Prince, Haiti.
KF3AA (Fletchers Ice Is.)	Via W2PGG.
KZ5EM	Melvin Menges, Box 77, Rodman, Canal Zone.
KZ5KG	Seymour Strauss, Box 500, Balboa Heights, C.Z.
OD5XX	Via OD5AB.
PR3WI (Washn Is. VR3?)	Via KH6YP.
PY5RT	Chas. Wielewski Catugi, Box 54, Apucarana, Parana, Brazil.
SP9KAD	Box 320, Warsaw, Poland.
TA3MP	Sfc. Meade Padgett, HALFSEE BOX #14, Navy 525, FPO, PM, N.Y.
W8HEV/8	Tom Woodward, 13510 Rutland, Detroit 27, Mich.
ZC2MAC/ZC2AB	Via G5RV
ZC5VS	Hugh, Box 136, Sandakan, Br. No. Borneo.
ZK1BG	Doug Berry, Govt. Survey Office, Rarotonga, Cook Is.
3A2AW (Monaco)	Via SM5ARP
3A2AX	Via G6LX

Thanks to West Gulf Bulletin. So. Cal. Bulletin, W1RAN, W3AS, W4CEN.

Note—This column closes on the fifteenth of each month. Please try to have all correspondence in my hands on, or prior to, that date. Thanks and 73, Dick.

DX AND THE SUN

(from page 18)

teresting to note that the maximum of the sunspot cycle reached during 1947 was the highest recorded since 1778. Conditions for the transmission of shortwaves were better in 1947 than they had been at any time since 1778, many years before the birth of radio itself. Of additional importance is the fact that since the discovery of the ionosphere in 1924, we have gone through only two periods of minimum sunspot activity, 1933 and 1944. During the minimum of 1933, some investigations were made of shortwave radio conditions. However, the stage of the art was only beginning at that time. During the next minimum of 1944, war-time conditions made it impossible to make world-wide ionospheric studies, so in reality the approaching minimum period is the first in which world conditions are such that investigation of the effects of minimum sunspot activity upon shortwave radio transmissions can be undertaken. There is no question that we will know considerably more about sunspot effects after experiencing the present sunspot minimum.

Figure 6 is a graph depicting the present sunspot

cycle which began in 1944. Since 1948, sunspot activity has been steadily declining. The dashed continuation of the graph, starting with September, 1952, is a prediction of the remainder of the present solar cycle. Since little is actually known about the theory or origin of sunspots, it is not possible to know *exactly* what laws or behavior patterns sunspots will follow. This prediction, therefore must be based upon certain estimates derived from studies of the behavior of the previous ten cycles. Based upon this prediction, there is less than a year and a half remaining before the minimum is reached, during the Winter of 1954-1955.

We have already shown that a relationship exists between sunspot activity and usable frequencies for a specific circuit. To determine to what extent DX conditions will be affected by the continued decrease in solar activity, it is necessary to analyze certain frequency data already recorded during the present cycle. *Figure 7* is a circuit analysis curve for an East Coast, U.S.A. to Western Europe path. During peak sunspot activity (smoothed sunspot number 150), the monthly median value of MUF for December, was approximately 45 Mc. Since daily variations of up to 15% from the monthly median values of MUF are not uncommon, this would indicate that trans-Atlantic openings on the amateur six-meter band might be expected on some days. Actually, this was the case as during December, 1947, trans-Atlantic six-meter openings were reported for this circuit. As solar activity decreased, the value of the maximum usable frequencies on this circuit also decreased. This past December, when the smoothed sunspot number was calculated to be about 27, the monthly median value of MUF had dropped well below 28 Mc., and the ten-meter amateur band did not open for this circuit. As solar activity continues to decrease, so will the value of MUF decrease. Conditions on all circuits are similarly affected.

End of part I. Part II will be featured in August.

DX CONTEST RESULTS

(from page 24)

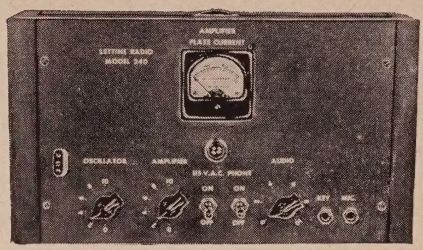
Asia

Cyprus			
All Bands	ZC4XP	19—51—	23,310
Israel			
All Bands	4XDF	37—100—	137,685
	4X4BO	13— 34—	12,784
14 Mc.	4X4DF	14— 44—	31,842
	4X4BO	11— 31—	10,920
21 Mc.	4X4DF	6— 12—	1,476
	4X4BO	2— 3—	60
Lebanon			
All Bands	OD5AD	28—71—	39,188

(Continued on page 62)

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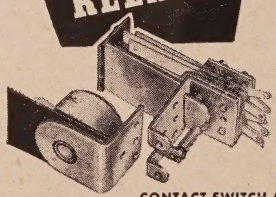
80, 20, 10 meter coils $2.91 per set. 160 meter coils $3 60. Also for CAP, Broadcast, MARS, Marine, State Guard, Novice.

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62 BERKELEY STREET VALLEY STREAM, N. Y.

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CAT. NO.	TYPE		COMBINATION	
200-1	Standard	8 amps	Single Pole	Double Throw
200-2	Standard	8 amps	Double Pole	Double Throw
200-3 Standard Contact Switch Parts Kit with complete assembly and wiring details				
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200-M1	Midget	8 amps	Single Pole	Double Throw
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200-M3 Midget Contact Switch Parts Kit with complete assembly and wiring details.				

13 COILS ASSEMBLIES

A.C. COILS* CAT. NO.	VOLTS	D.C. COILS CAT. NO.	VOLTS
200-6A	6 A.C.	200-6D	6 D.C.
200-12A	12 A.C.	200-12D	12 D.C.
200-24A	24 A.C.	200-24D	24 D.C.
200-115A	115 A.C.	200-32D	32 D.C.
		200-110D	110 D.C.
		200-5000D for current type	

*All A. C. coils available in 25 and 60 cycles

GUARDIAN ELECTRIC

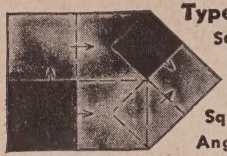
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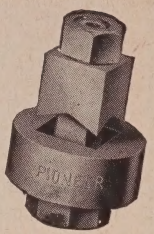
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11/16	$3.25				
3/4	$3.50				
7/8	$3.85				
1	$3.95	1	$2.15		
● KEYED		1 1/16, 1 1/8, 1 5/32	$2.30	1 3/8	$2.60
1 11/64	$3.50			1 1/2	$2.95
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(from preceding page)

Oman				
14 Mc.	VS9AW	13	21	4,114
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14 Mc.	ZC6UNI	4	5	117

Oceania

Australia				
21 Mc.	VK4FJ	4	5	72
	VK5FO	1	2	3
Hawaii				
All Bands	KH6IJ	38	59	110,677
	KH6MG	40	52	66,700
3.5 Mc.	KH6IJ	5	4	684
	KH6MG	4	3	357
14 Mc.	KH6IJ	20	36	29,568
	KH6MG	20	28	19,896
	KH6LG	19	27	18,998
	KH6CD	19	27	15,916
	KH6ER	15	22	9,324
28 Mc.	KH6IJ	13	19	17,184
	KH6MG	16	21	9,640
Marshalls				
14 Mc.	KX6AS	15	18	5,445
New Zealand				
All Bands	ZL1MQ	31	50	20,736
	ZL1HY	16	16	1,696
3.5 Mc.	ZL1MQ	2	4	24
7 Mc.	ZL1MQ	2	2	8
	ZL1HY	2	2	24
14 Mc.	ZL2GX	25	52	45,122
	ZL1MQ	20	35	11,660
	ZL1HY	10	9	684
21 Mc.	ZL1HY	4	5	99
	ZL1MQ	3	5	56
Niue				
All Bands	ZK2AA	27	37	22,336

Present and Prophetic

Baltimore, Md.

The Sixth Annual Hamfest Picnic, sponsored by the Baltimore Amateur Radio Club, has been scheduled for Sunday, August ninth, at Triton Beach, Mayo, Md. Tickets are $1.00 per person (children half price); this price includes bathing privileges, the use of the bathhouse, locker, picnic tables, and the pavilion. Beer and soft drinks will be on sale. An interesting program has been planned, and there will be awards for the best mobile installations. Bring your picnic basket and remember that the festivities start at 1000. W3PSG will be on hand to guide visiting mobiles. From Washington take Route 214 through Capital Heights to Route 2. From Baltimore take Route 2 through Annapolis, then follow the Hamfest signs. For further information, write Chairman Ernie Dobbs, W3JCL, 2208 North Fulton Ave., Baltimore 17, Md.

Kokomo, Ind.

The Kokomo Amateur Radio Club, Inc. has scheduled their annual Hamfest for August sixteenth. The "Big Bull" session will be held in Highland Park. Registration will start at 1030. The lunch will be pot luck; you are urged to bring something. A transmitter hunt and entertainment for the XYL and the little QRM's will be provided. The registration fee is $1.00. Advance registration is not necessary, but may be obtained through W9DKR, on 75 Phone.

Traverse City, Mich.

The annual Buzzard's Roost (BR) Net picnic, under the sponsorship of the Cherryland Radio Club, Inc., is to be held during July 19th on the site of the 4-H Camp, situated near Traverse City. Bring your family and friends. Tickets will be available at the Gate.

Jamestown, N. Dak.

The Jamestown Amateur Radio Club will be host to the sixth annual North Dakota Hamfest to be held July 12 at Jamestown, North Dakota. The registration fee is two dollars which includes family or friends.

Honolulu, T.H.

The Honolulu Amateur Radio Club will hold an all-day Ham convention during August fifteenth at the American Chinese Club pavilion, 2343 Kapiolani Blvd., Honolulu. There will be contests, panels, demonstrations, XYL activities, and exhibits during the day, culminating in a big steak dinner in the evening. Valuable prizes, including a transmitter kit and receiver, will be awarded to the winners of the many events. Registration starts at 0800. The fee will be $5.50 in advance or $6.00 at the door. For further information, contact H.A.R.C., Box 2868, Honolulu, T.H.

HANDY-TALKIE

(from page 47)

as in the receiver, be sure to ground *pins 2, 3,* and *7*. Coils *L1* and *L2* are wound over an *Eveready #915* to get the proper diameter, and *L3* is wound over *L2*. After the coils are in place spray with *Krylon* to make them mechanically stable.

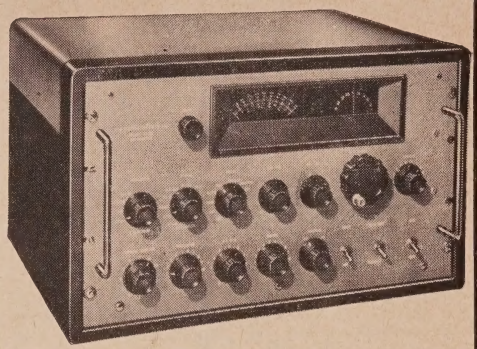
The Antenna

The only item that takes a little special adjustment is the center loaded whip antenna. Since most Hams probably have their own ideas about what they want to use for the antenna there will probably be some difference in the number of turns required in the loading coil. The antenna the author used was a two-section collapsible car whip. The loading coil was made out of a 3½" x ¾" lucite rod. The first coil should be made by putting on approximately the proper number of turns and providing a tap every second turn. Then, with the aid of a field strength meter, tap off turns until the maximum output is obtained. Be sure to re-dip the final after each change in taps is made. Then remove the temporary coil, and rewind the coil with the proper number of turns, and coat with *Krylon*.

That's all there's to it. You'll find it very basic, and simple to build, and you'll get plenty of coverage. After field checking this unit we found that it had a positive one-mile radius coverage in both transmit and receive with good coverage up to five miles. The author believes this to be adequate for most emergencies and coverage requirements.

HALLICRAFTERS HT-20

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Here's the transmitter you've been waiting for! Continuous coverage from 1.7 Mc to 30 Mc. Full band switching, no more plug-in coils; choice of 10 crystals. Shielded, filtered r-f compartment plus low-pass 52 ohm co-axial line output filter cuts anything over 30 Mc.

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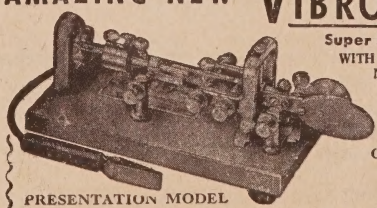
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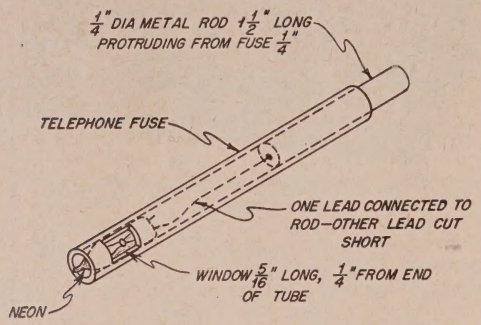
THE VIBROPLEX CO., INC. 833 Broadway, N. Y. 3, N. Y.

Inside the

Shack and Workshop

An Indestructible Neon Bulb Holder

While the idea suggested by WØSGG in the August 1952 *Shack and Workshop* is very handy when it comes to preventing a shock while handling these small neon bulbs, it still leaves much to be desired. This is especially true if you have a habit of leaving them lay around the work bench and carelessly dropping something on the bulb. Frankly, I'd prefer a more solid type of housing.



I came across the telephone type fuse with the long cartridge and salvaged one to hold my G.E. neon bulb (NE-2). I cut a little window into it as shown in the drawing. A short piece of ¼-inch round metal stock wedged into the other end is my probe. It is now very insulated and practically indestructible as proven by the XYL when she accidentally ran it through the automatic washer one day while doing my work pants.

Allan Walston, W6MJN

The Latest Returns

Within the last couple of months the Post Office has returned to us a large number of 1951 CQ-DX Contest certificates because of insufficient or improper address. If you have not yet received your certificate, will you look down the following list; if your name is there, send us your *new, complete* address.

DL1FK	Richard Auerbach
DL4WC	Norbert B. Ostrye
F7AR	Albert H. Hix
GW3HGB	J. Mills
JA2DS	Dale B. Schermerhorn
K2FAL	William A. Werber
KH6ADY	Theodore E. Sharp
KH6PA	Hubert J. Martin
KL7CM	G. Wayne Martin
MI3RR	Richard Reimann
MI3ZX	Leroy J. Morgan
VE3BBR	John H. McLeod
VE7KC	A. H. Miller
W4RWZ	Oliver G. Skipper
W5SFW	Philip W. Patterson
W6QOY	Robert A. Eisen
WØAEK	Harry M. Shroyer
ZS6VR	Dr. C. J. Rabie

70% of all CQ readers keep their copies for three or more years.

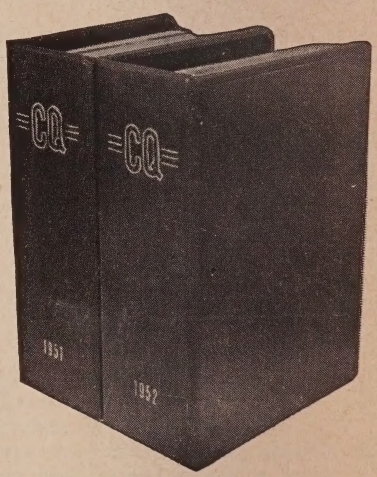
(reader survey)

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SINGLE SIDEBAND

(from page 32)

generally. We must, however, furnish a grid voltage swing from our driver sufficient to "get the show on the road."

A class AB2 amplifier is a cross-breed of the AB1 type and the full class B animal. The average plate current (as read on a plate current meter), will kick upward and the grid will swing into the positive voltage region for a portion of the excitation cycle and therefore draw grid current. The no-signal plate current is generally higher than that encountered in full class B stages.

The bias on the control grid is usually set so that the idling plate dissipation of the tube is approximately half of the maximum specified for the tube. When signal is applied the input goes up, there is power delivered to the output circuit, and the remaining power not lost in the output tank circuit or coupling circuit appears as the *operating* tube plate dissipation. This *operating* dissipation does not exceed the maximum rating—at least not for long. More on this later.

From the foregoing discussion I believe that you can sense that the class B amplifiers are the ones that get "horsed around" a bit. The plate current is run at a lower idling value by increasing the bias and the grid is usually driven farther into the positive voltage region, drawing more grid current, and requiring more grid driving power. The plate current swings over a greater range than do the previously mentioned classes of amplifiers. Correspondingly, the efficiency is higher (theoretical maximum is 78%) and the possibility of having more distortion products is greater.

Which is the best class of amplifier to use? Let's talk *around* the subject for a bit and then try to come to some reasonable decision.

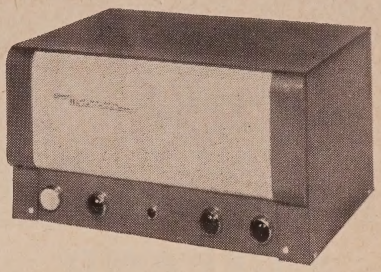
Non-linear?—WHO, ME?

This term "distortion products" keeps popping up all the time. Just what are they? In conventional double-sideband AM we would call it *splatter*. Surely, I won't have to draw pictures to explain that particular point. How are they generated in a linear (so-called, that is), amplifier? Let's keep the discussion simple and on a plane with us common folk. A true linear amplifier will produce output signals that are amplified replicas of the input grid signal. If the grid signal varies in amplitude between the limits of 1 to 2 volts, the output signal must vary between the limits of say 100 to 200 volts. As you can see we have a voltage gain of 100. But, suppose the output signal didn't quite make the grade and varies between 100 and 185 volts for the same 1 to 2-volt grid swing mentioned. That, my friend, is non-linearity. Going on with this thinking, assume that we have an r-f linear amplifier with one tube and a parallel-tuned output circuit tuned to the desired operating fre-

(Continued on next page)

NEW MOTOROLA

Home Unit Monitor Receiver



Now available—the new Motorola Monitor or Alert Receiver, for operation in the 25-50 mc. and 152-174 mc. ranges. Optional selective signaling, emergency 6 VDC power supply, and red-yellow-blue-white light alert cabinet attachments. Ideal for amateur, as well as public safety, civilian defense, industrial and commercial radio systems.

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350-0-350 at 350 ma. 6.3 at 10A, 5V at 6A. Pri. 115V, 60 cy. AC. Only.....$8.95 ea.

450-0-450 at 200 ma. 5V at 3A, 6.3 at 5A. Pri. 115V, 60 cy. AC. In shielded case. Only.....$8.90 ea.

920-0-920 or 740-0-740 AC at 200 ma. Pri. 115V, 60 cy. AC. Upright shielded case. Excellent for 807's. Only.....$10.80 ea.

Isolation transformer. Useful for AC-DC supplies, etc. Pri. 117V, Sec. 150V AC at 25 ma. Also, 6.3V at ½ amp. Only.....$1.80 ea.

Isolation transformer. Pri. 115V, Sec. 117V at 50 ma. Also, 6.3V at 2 amps. Only.....$2.79 ea.

2.5V at 10A AC. 10,000V insulation. Pri. 115V, 60 cy. AC. Only.....$3.39 ea.

Modulation transformer, 15 watt. Both pri. and sec. adjustable for 2000 to 20,000 ohms. Pri. 50 ma per side, max. Sec., 50 or 100 ma depending upon connections used. Only.....$6.45 ea.

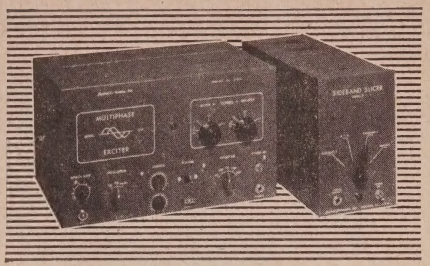
Modulation transformer, 60 watt. Also adjustable with pri. and sec. adjustable for 2000 to 20,000 ohms. Pri. 150 ma per side. Sec. 150 or 300 ma depending upon connections used. Only.....$9.60 ea.

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MULTIPHASE EXCITER MODEL 10A (upper left) Approx. 10 watts peak output 160 to 20 meters, somewhat less on 10-15 meters. Will drive beam power tetrodes to more than 1 KW input from 20 to 160 meters. SWITCHABLE SSB, with or without carrier, double sideband AM, PM, break-in CW, VOICE OPERATED BREAK-IN and receiver disabling, it's ALL BUILT-IN to this truly versatile exciter. Built-in power supply also furnishes blocking bias for linear amplifier and voltage for optional VFO. With internal xtal and coils for one band. Wired and tested **$159.50.** Complete kit **$112.50.** Extra coil sets **$3.95** per band.

QT-1 ANTI-TRIP UNIT

Plugs into socket inside 10A EXCITER. Permits loudspeaker operation, yet prevents voice-control circuit from tripping on heterodynes, static, noise pulses or loud signals. All electronic, no relays, adjustable trip level. Completely wired, with tube. Price.....**$12.50**

SIDEBAND SLICER

MODEL A RECEIVER ADAPTER (upper right) Improves any receiver. SWITCHABLE upper and lower sideband reception of SSB, AM, PM and CW. Cuts interference and heterodynes in half. Eliminates distortion caused by selective fading. Works into any receiver having 450-500 KC IF. Built-in power supply. Use a Model A Slicer—notice the "holes" in even our most crowded bands and hear signals you have never heard before. Wired and tested **$74.50.** Complete kit **$49.50. PS-1** Plug-in prealigned 90 degree phase shift network and socket available separately for use with GE Signal Slicer and SSB Jr. **$7.95** postpaid. WRITE FOR LITERATURE

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GOTHAM HOBBY CORP., 107 E. 126 St., N. Y., N.Y.

(from page 65)

quency. The non-linear condition will produce a fundamental-frequency plate current pulse to flow in the tank circuit and *also* harmonic signal currents—the 2nd harmonic, the 3rd, etc. If our tank circuit has a good operating Q the harmonic signals will not be transferred to the output circuit. However, if we have an input grid signal made up of more than one signal frequency—say a group of frequencies representing a human voice—something peculiar takes place. Each of these frequencies when passing through our non-linear amplifier will have harmonic frequencies generated that will be near 8 Mc., 12 Mc., 16 Mc., and so on if our fundamental operating frequency is at 4 Mc. As you might guess each of these harmonic frequencies will be slightly different from the others. We now are in a position to see how intermodulation distortion comes about.

At this point we had best use specific numbers and see how this works. Assume a suppressed-carrier frequency of 4000 kc. and generate a lower-sideband. Pick two audio input frequencies for convenience—say 1000 cps. and 2000 cps., which will net us two sideband signals at 3999 kc. and 3998 kc. respectively. Passing these through our *non-linear* "linear" amplifier will produce the following. The fundamental signals, 3999 kc. and 3998 kc. will certainly appear in the output.

Will the second harmonic, third harmonic, and so on appear? For all practical purposes, no. Not so fast, now. What are the figures for second harmonics? The second harmonic of 3999 is 7998 kc. and of 3998 is 7996 kc. The third harmonic of 3999 is 11,997 kc. and of 3998 is 11,994 kc. Since our amplifier is non-linear it is capable not only of amplification but also of *heterodyning.* You remember in *Part II* of this series we said that any non-linear device could be used as a mixer or heterodyne device.

Back to the arithmetic. Keep in mind that any mixtures of the fundamental frequencies and *any* of the harmonic signals or mixtures among the harmonic signals themselves must fall near the 4000 kc. operating frequency to be of concern. All other combinations will be disposed of by the selective properties of the tuned circuit. Follow along now.

Case 1. Mixing the 2nd harmonic of 3999 which is 7998 kc. and fundamental signal 3998 kc. 7998 plus 3998 = 11,996 kc. (will *not* appear in output).
7998 minus 3998 = 4000 kc. (*will* appear in output).

Case 2. Mixing the 2nd harmonic of 3998 kc. (7996 kc.) and the fundamental signal frequency of 3999 kc.
7996 plus 3999 = 11,995 kc. (will *not* appear).
7996 minus 3999 = 3997 kc. (*will* appear).

Case 3. Mixing the 3rd harmonic of 3998 (11,994

kc.) and the 2nd harmonic of 3999 (7998 kc.) 11,994 plus 7998—(will *not* appear). 11,994 minus 7998 = *3996 kc.* (*will* appear).

Case 4. Mixing the 3rd harmonics of 3999 (11,997 kc.) and the 2nd harmonic of 3998 (7996 kc.) 11,997 plus 7996—(will *not* appear). 11,997 minus 7996 = *4001 kc.* (*will* appear).

Let's stop this pencil pushing and look at what has been happening. We have considered only the 2nd and 3rd harmonics of the two signals fed into our amplifier. The 4th, 5th, and so on might be significant also, but what we have done so far will illustrate the point very well. We have fed only two frequencies into the input of the amplifier and *look* at what comes out to the antenna terminals! The original signals, 3999 kc. and 3998 kc., of course, are there. The following signals are also there: 4000 kc. (happens to be at the carrier frequency), 3997 kc., 3996 kc. *and* 4001 kc. All but the last one are at or below the carrier frequency, but the 4001 kc. product is in the *upper sideband.* This is in the region where we have tried so hard to keep things from happening. The ones that fall in the lower sideband where we transmit our intelligence will not really annoy us unless our signal really "stinks to high heaven." In this case not only will your best friend tell you, but half the stations on the band will be gunning for your hide.

SSB and TVI

Someone is bound to ask about the harmonic signals that are generated in the above process. Do they cause TVI? The answer is generally *no.* If the output tank circuit has a loaded resonant *Q* of from 12 to 15 there is very little danger of any appreciable harmonic energy being transferred to the antenna circuit. The amounts of harmonic energy we have been talking about are so small when compared to those generated in a class C amplifier that this alone minimizes the possibilities of harmonic radiation *and TVI.* Harmonic TVI, as you know, is the one that is hard to eliminate. The possibilities of front-end over-load are about the same as with any other transmitter of equivalent power. The SSB gang have a little saying concerning harmonics. It is, "If you don't generate 'em, you can't radiate 'em."

Linearity—How to Get It

The picture has been painted pretty black so far. We have seen what distortion products are and how they come about. The cure isn't really so unpleasant. It is just following good common sense. The following sections will deal with the different localized causes of distortion and how to overcome them.

Grid Circuit Distortion

This is probably where the greatest troubles are caused in the average amateur linear amplifier. These fall into three general classes:

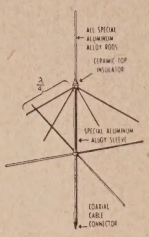
1. *Grid bias troubles.* The bias may be too high

(Continued on next page)

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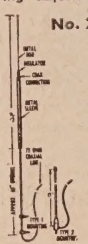


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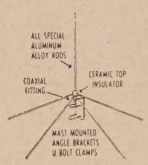
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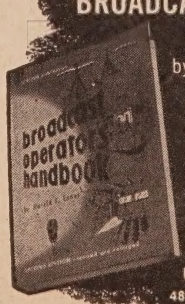
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(from page 67)

causing the tube to operate on the non-linear "knee" portion of its characteristic curve near cut-off. The bias might also be too low. This causes the idling tube plate dissipation to be excessive. A visual check will usually warn you of this condition. Where the exact value is not known a handy rule-of-thumb to use when adjusting bias on a linear amplifier is to adjust the no-signal plate input so that the plate dissipation of the final tube (or tubes) is *at least* 1/3 to 1/2 of the maximum rated tube plate dissipation. Another grid bias requirement is that the bias voltage *must remain constant* under all operating conditions. This dictates that there must be *no resistance* in the grid circuit whenever any grid current whatsoever is drawn. The bias supply, whether electronic or battery, must have no internal resistance—either use regulator tubes on a supply or a new battery. There is one obvious way to dodge this particular problem —that is to use zero-bias tubes. More about this later.

2. *Grid signal voltage regulation.* If the amplifier being considered never draws any grid current (as in class A or class AB1) this is of no concern. However, if the grid at some time during the grid excitation cycle swings positive and draws grid current the load on the driver stage increases sharply and causes the grid signal voltage to drop from its otherwise no-load value. This trouble is primarily not in the grid circuit, but is dependent on the so-called "internal resistance" of the driver stage. An analogy might be used to good advantage here. Consider a small motor driving a fly-wheel which in turn is coupled to a propeller with variable pitch. If the propeller pitch is set for zero (no air being moved) the load is very light on the fly-wheel and its source, in fact, the motor hardly realizes the propeller is connected. If, however, the pitch of the propeller is increased sharply and erratically, the load on the driving motor and fly-wheel will increase sharply. The speed of rotation will tend to decrease and the driving force to the propeller will also decrease. To cure this in the mechanical analogy we must either use a larger motor, or install a heavier fly-wheel. Actually, the best solution is to do both—within reason.

Back to our driver stage in the transmitter. To maintain the grid voltage during the periods of heavier loading (during grid current periods), we can lower the "internal resistance" of the stage by raising the tuned circuit Q (lower L to C ratio) along with some swamping of the driver stage plate circuit with a resistor (a larger fly-wheel), but to keep things going, we will require more power from the driver stage (a larger motor). A healthy attitude to take about this matter is to plan on generating about four times the power you expect to use in driving the final amplifier stage and then swamp the remaining three quarters of the power with a resistor across the driver tank. Sure, this is wasteful, but in the long run is well worth the trouble.

3. *Grid drive.* Obviously, the grid can be over-driven and the stage goes into "saturation"—as some say. This over-driving will cause flattening of the peaks of the output wave-form and produce distortion in large quantities. Conversely, the grid can be getting too little drive and the driving stage can be called upon to deliver more than it is capable of and distortion will be generated *in the driver, not* in the final.

Plate Circuit Distortion

The plate tank circuit is the gadget that transfers the signal energy from the final tube to the antenna circuit. It also performs another valuable function as we mentioned before. It takes the half-sine waves that the tube furnishes and through the fly-wheel effect of the resonant circuit supplies the missing half cycle of the r-f waveform. In order to do this the operating Q of the plate tank must be high enough so that the efficiency will not fall off. The generally accepted limits of the loaded circuit Q are from 12 to 15.

Distortion is created in an amplifier when the loading is maladjusted. If the loading is too light, the amplifier will be driven into saturation much sooner than normal and the output power of course will be considerably reduced. If the loading is too heavy, the stage will not saturate easily, but the output power will be lower than that obtained at optimum coupling. Use some sort of output indicator (an r-f ammeter in the antenna, or field intensity meter), and adjust the coupling for maximum output for some high fixed value of input power.

The plate tank circuit will be dealt with in more detail in the section dealing with design considerations.

End of part IV. Part V will Appear in August.

PROPAGATION CONDITIONS

(from page 41)

During 1952, July was one of the most active months of the entire year for short-skip propagation with significant Sporadic E activity observed at the Bureau of Standards in Washington, D. C., for 75.6% of the time. Frequent short-skip openings are therefore expected on 10, 15 and 20 meters with the possibility of some openings also on six meters.

Here is a tip for VHF readers that can be used as a guide for determining the possibility of six-meters opening for Sporadic E propagation. The geometry of propagation is such that as the short-skip distances are observed as **decreasing** on 20, 15 and 10 meters, the frequency that will be reflected by the Sporadic E cloud is **increasing.** When you are hearing stations less than 500 miles away on ten-meters or about 400 miles or less on fifteen-meters, the chances are very good that six-meters will open in the same general direction with the skip out about 1000 miles or greater. Observations at Washington, D.C., during July, 1952, indicate that six-meters may have opened for a 1000 mile path with Washington as the mid-point, on at least 11 days of the month.

Next month, this column will discuss the latest progress in propagation research as reported at the joint meeting of the International Scientific Radio Union (URSI), and the Institute of Radio Engineers held recently at Washington, D.C.

This month's **Propagation Charts** are based upon a predicted smoothed 12-month running average Zurich sunspot number 20, centered on July, 1953.

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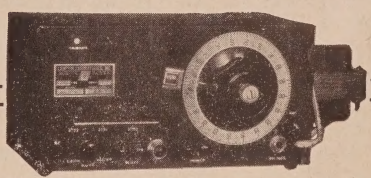
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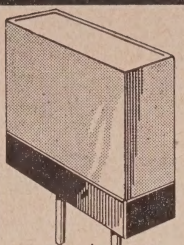
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381	416	453	486	519
383	418	454	487	520
384	419	455	488	522
385	420	456	490	523
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394	430	465	498	534
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HAMPLATES: Your call letters on heavy aluminum plates 5½ x 11 on Scotchlite background $3.00 pair. Hamplates, Box 8366, Portland 7, Oregon.

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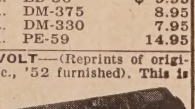
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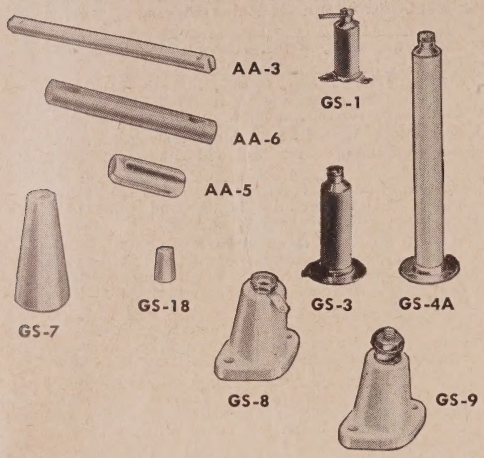


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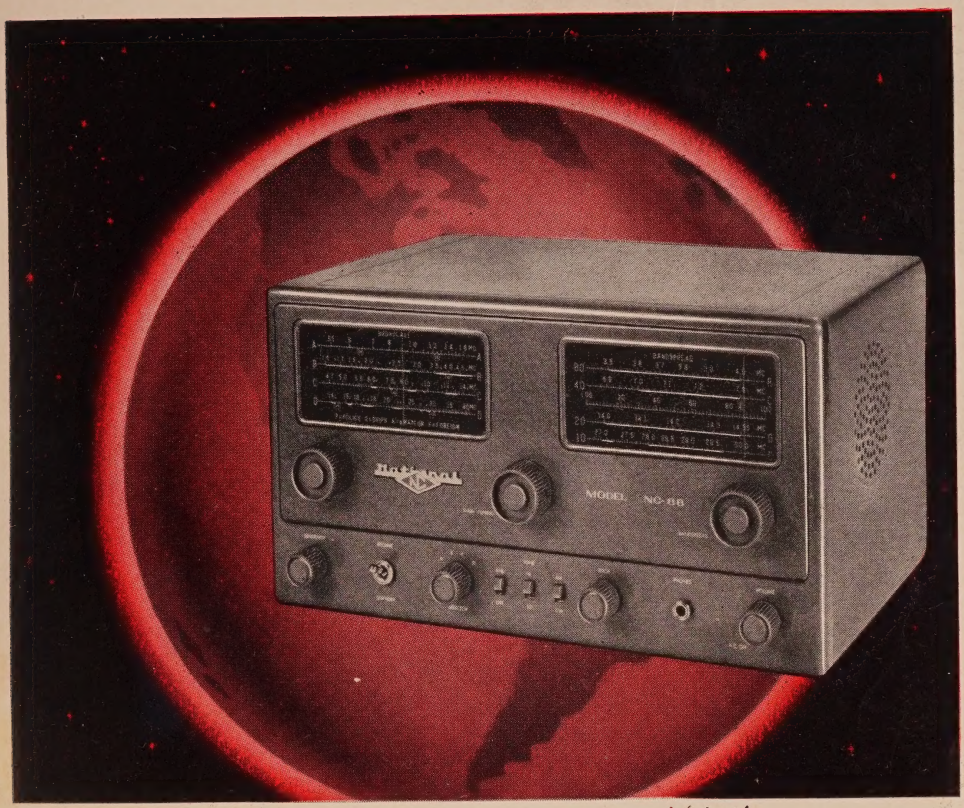
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