Building the Heathkit

Cheyenne

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"Only 90 Watts!!", "Into a vertical?!!", "Thought you had a quad for sure," "Sounds beautiful," and on 20 meters "Brother, I was sure you were running a full gallon into a beam, the audio is beautiful." These are actual comments from the receiving end of Heath's new mobile transmitter the "Cheyenne." Everyone on the air, from KJ6-land in the Pacific Ocean through VO land in Newfoundland are rendering Q5 S9 reports and from South America comes Q5 and 25/9 with "very, very good audio." The first 47 contacts all Q-5. The new little Cheyenne is dispelling some of the old fears and bad reputation of carrier controlled modulation. Most probably as a result of the real fine mating of the transmitter and the Electro-voice Model 727 ceramic microphone which is included in the kit.

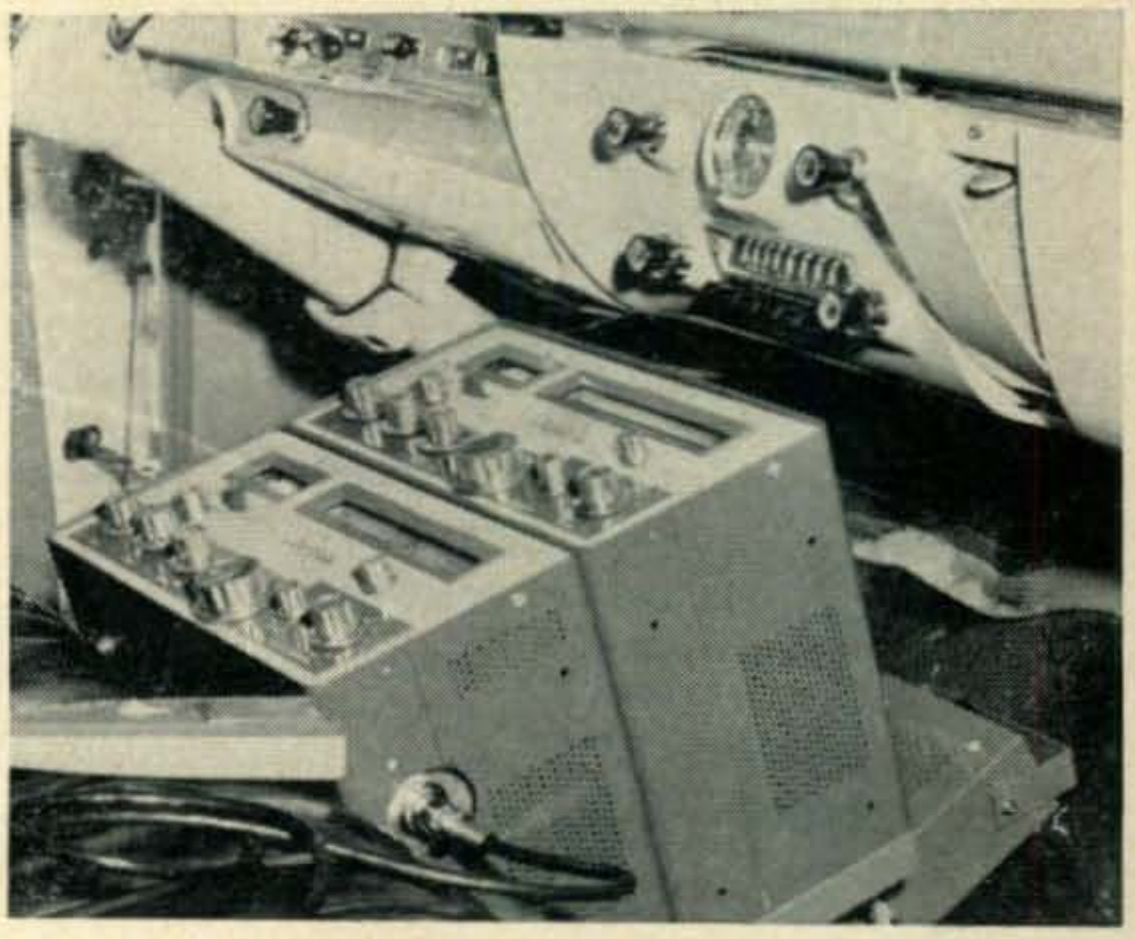
The Heath Company has maintained its exceptionally high quality of components and exacting mechanical tolerance again in its new mobile transmitter. The little gem is easily assembled and put on the air in about thirty hours of good honest work. However, the instruction manual for the Cheyenne was not as well edited as was the instruction manual for the "Comanche" receiver, there being several noticeable errors and confusing instructions.

Assembly

The first steps include assembly of the main dial mechanism. Inasmuch as this is probably the most handled part of the transmitter, a couple of construction details should be most strongly emphasized. Be absolutely sure that the tuning mechanism works flawlessly before you continue with construction. This can be aided by very careful mating of the "Pointer drive gear shaft assembly" #100-202 and the "pinion gear shaft assembly" #100-201 into their respective oilite bearings. A thorough polishing and buffing of the bearing surfaces will help insure smooth operation. This may be accomplished with a power buffer and/or crocus cloth (not sandpaper!!). Be extremely careful not to decrease the size of the shaft to the extent of causing a loose fit. The same smoothing treatment should also be accomplished on that portion of the pointer bracket (204-M215) on which the dial drum pointer (463-15) rides. This is very important because the pointer bracket is subject to receiving nicks and burrs during handling and the tiniest nick can snag the dial pointer and be a source of continual irritation. It should be noted here that although the tuning mechanism appears the same, and the Cheyenne instruction manual states the tuning mechanism for both the Cheyenne transmitter and the Comanche receiver is identical, it must be assembled differently for each. Basically, the spiral drum spring #258-10 and associated parts are located on opposite ends of the dial drum. This point is emphasized so that each builder will not have to trace all the way through the book to find out whether or not the assembly instructions are correct.

Reference figure 6b and 6c, page 14 and figure 7 page 15. Change the numbering of the lugs on the two 15 mmf variable capacitors Q and JJ in figure 7 to correspond to the numbers indicated in figure 6b and 6c.

Note on step #10 page 22 that the braid connection is the *eyelet*, not the lug.



Reference figure 19a page 27, and steps 9 and 10 page 28. The placement of the 10 and 15 meter drive coil and the 10 mmf N750 capacitor is rather difficult and may be made somewhat easier by preforming the leads of each, prior to making permanent connections on either.

Change Step 5, page 30 from "—pin 7 of tube V-6 (S-2)—" to read "—pin 7 of tube V-6 (N-S)—".

Change Step 7, page 30 from "—pin 7 of tube V-6 (NS)—" to read "—pin 7 of tube V-6 (S-2)—".

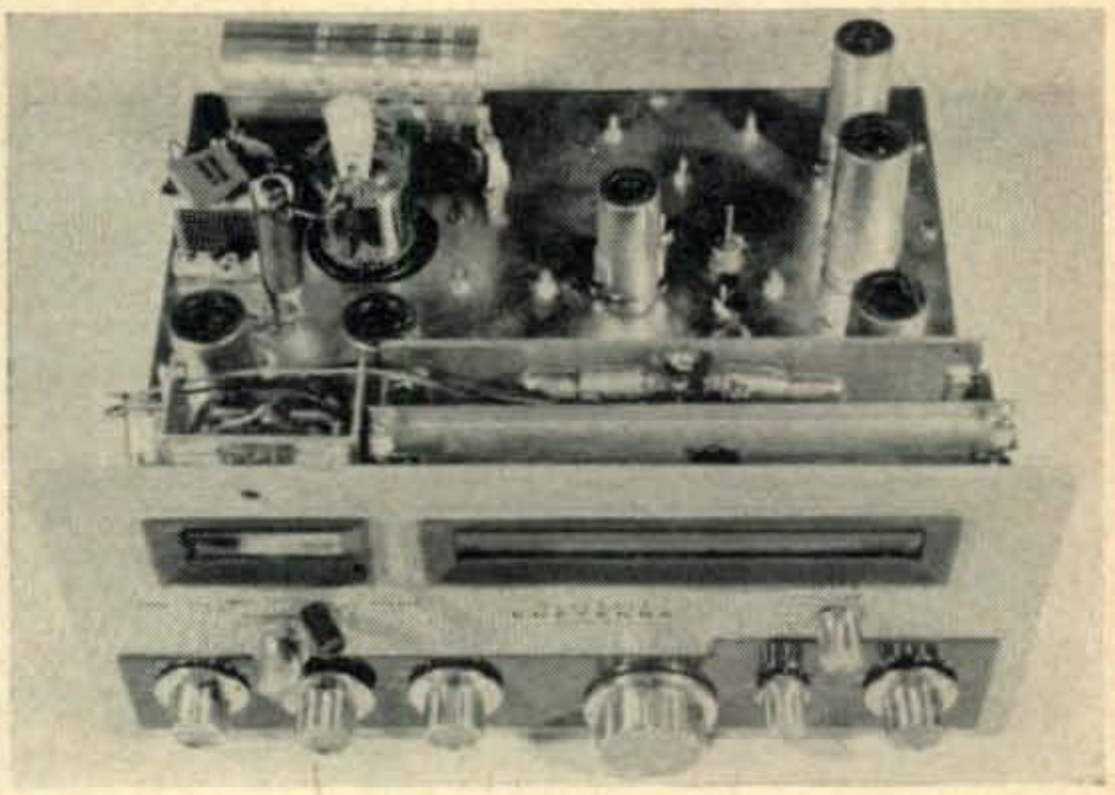
Reference Step 8, page 38 add—"refer to figure 31 for correct placement of switch."

Reference Step 1, page 42 change from "—terminal 1 on the spotting switch (S-2)" to read "—terminal 1 on the spotting switch (NS)."

Calibration

The calibration procedure is very well described in the manual and will not be elaborated on further other than to suggest the

procedure can be combined with alignment and bandspreading of the receiver. This should probably not be done during the initial calibration because of the possibility of inadvertently turning the wrong thing. It was done during a subsequent re-checking and touching up alignment and bandspreading of both the transmitter and receiver. First bring the *vfo* of the Cheyenne to zero beat with the standard and then zero beat the Comanche with both. Consequently, now both the Comanche and Cheyenne dials read the same for a given frequency. This procedure seems to instill more confidence in the dial readings and imparts a desire for a higher degree of accuracy than when each unit is calibrated separately. There is much less interaction between the trimmer capacitors R, Q and JJ, which set the frequency spread, and coil slugs A, B and C, which give a definite frequency point on the dial, than exists when bandspreading the Comanche. Consequently, *vfo* calibration is relatively quick



and easy, taking less than thirty minutes to accomplish. The Cheyenne *vfo* circuit consists of a 6AU6 tube operating as a Clapp or series tuned Colpitts oscillator with output frequency ranges of 1750-2000 *kc*, 7000-7175 *kc* and 7000-7425 *kc*. Both screen and plate voltages are stabilized by an OA2 regulator tube. The *vfo* switch uses an interrupted bandswitching mechanism in such a way that the *vfo* output is used on 80 meters (1750-2000 *kc*); 10 & 40 meters (7000-7425 *kc*) 15 & 20 meters (7000-7125 *kc*). Stability of frequency on all three outputs was within 3 *kc* during each of two test periods of four hours each. Several stations have voluntarily noted they did not have to retune their receiver at all during hour long QSO's.

The two position spotting switch makes possible zero beating without going on the air and additionally, by having it a two-position rather than a push-button, one can easily perform the zero beat operation while driving. Don't forget to turn it off, however. I had a report of a chirpy *cw* signal and discovered I'd inadvertently left the spotting switch on. Turning it off cured the chirp and all *cw* reports have been 5-7-9 or better. A test was made on fone and absolutely no difference in audio could be detected with the spotting switch on.

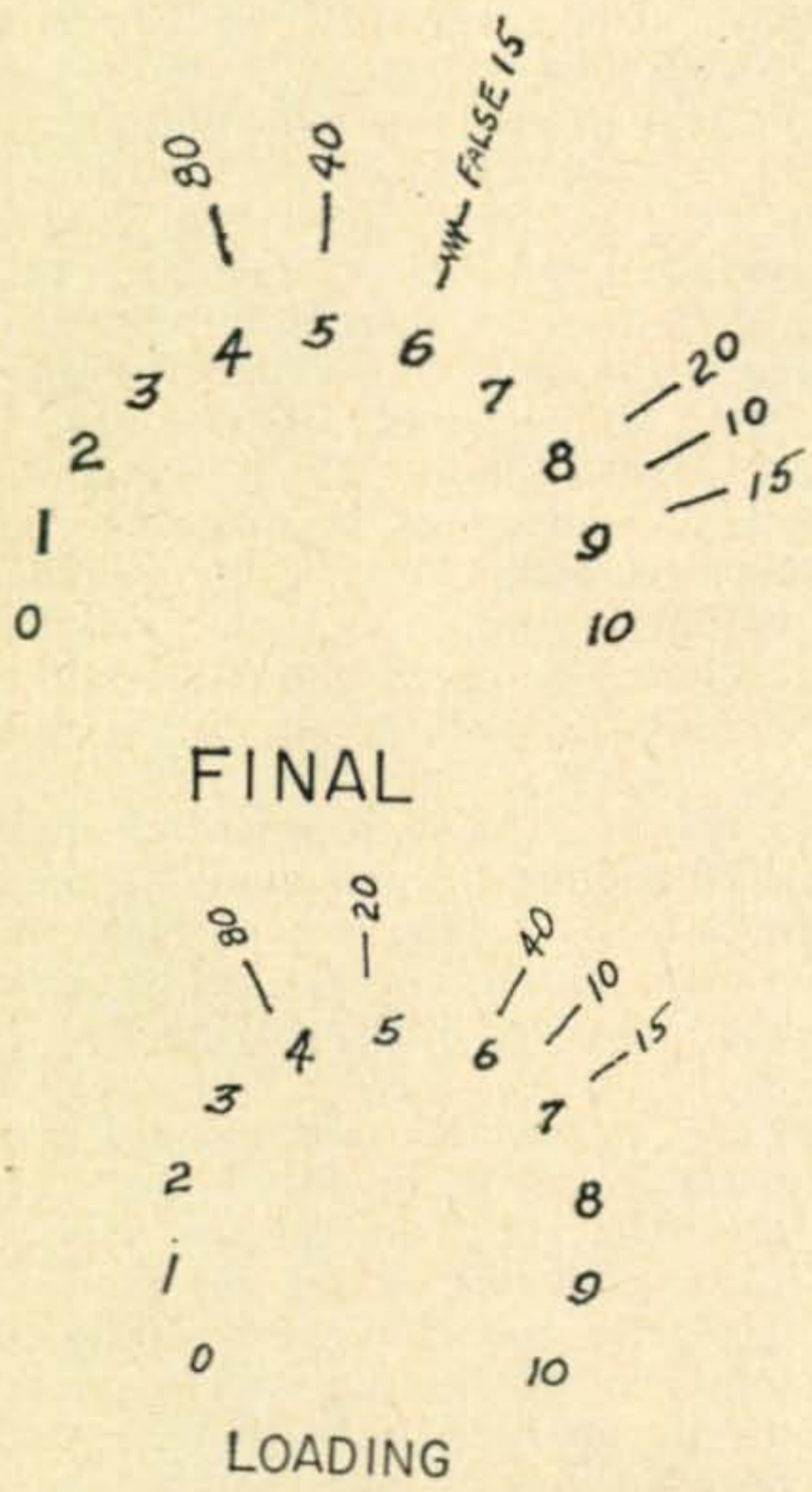
Many people have been apprehensive about the characteristics of carrier controlled modulation; however, I have requested a very "critical" report from each station and all reports have been very fine, and I'm beginning to believe that some of the older attempts at carrier controlled modulation were faulty due to not having the proper microphone balance and drive.

Yours truly had no desire to operate on 80 meters but had a requirement to operate on MARS frequency 4350 *kc*. The slug tuned *vfo* Coil C (#40-115) and the trimmer capacitor R (#26-44) were reset so that with a reading of 3950 on the dial of the Cheyenne the actual output was 4350 *kc*. This indicates a range outside the amateur band of at least 400 *kc* is available if needed. I'm sure the actual range would be considerably more because neither the coil nor the trimmer were close to their limits. This arrangement makes the entire 80

meter band useless for the 80 meter amateur band unless the *vfo* output is realigned. The same procedure could undoubtedly be used on the other *vfo* output frequencies. However such an arrangement would affect both the 10 meter and 40 meter band or the 15 meter and 20 meter band because they each use the same *vfo* output.

Tuning

No difficulty was encountered on any band except 15 meters. On fifteen I goofed again and spent some time transmitting out of the band. (I think). However, I haven't received a QSL from the FCC as yet so maybe I just



wasted my own time. What happened is this—when dipping the final on fifteen I tuned up on the first dip (counting clockwise) instead of the second dip, so I was probably doubling out at 14,000 *kc*-14350 *kc* somewhere instead of tripling out on the 15 meter band. This first dip occurred at number 6 on the final and the correct dip occurred at number 9.

It might be wise to use either a wavemeter or have a nearby ham listen for you to insure getting the final tuned properly. The following diagram gives the positions of the final and loading controls on the author's rig when adjusted to resonance on each band. Individual rigs may vary somewhat, but if resonance is indicated in a greatly different spot it might be wise to investigate or at least have your local friend confirm the location of your signal on the band.

It should be pointed out that the complete Heathkit mobile rig, i.e., Cheyenne transmitter, Comanche receiver, transistor power supply, speaker and mobile mounting bracket, contains several extras that usually must be purchased separately, eg ceramic microphone (Electro-voice model 727), antenna changeover relay, power supply relay, all power supply cabling and connecting gear including battery terminal studs and drill bit!! The only item not included is a 10″ piece of coax with two male connectors to connect the transmitter and receiver antenna together. The power supply manual contained complete information and suggestions on how to use the supply with both negative and positive grounded electrical systems as well as complete information on how to convert a single battery 6 volt system to a dual battery 12 volt system.

The author's rig was installed in a 1959 Kingswood station wagon in less than 4 hours which included mounting the power supply, speaker, installing mounting bracket on the floor of the front seat, installing antenna and running antenna leads. Subsequent removal and installation of the transmitter-receiver combination takes less than one (1) minute and only involves loosening two wing screws, unplugging power connector and speaker and disconnecting antenna lead. If a suitable 110 *vac* power supply and antenna is available in the shack, you end up with an extremely versatile piece of gear total weight about 30 pounds that will give many hours of pleasure both fixed and mobile with a minimum of cost and inconvenience in changing from fixed to mobile.

Antenna

The antenna in use on the mobile installation are entirely Master Mobile products starting with the model 232-C base mount located on the right rear fender 38½ inches above the road followed by a quick disconnect, then a 36-inch extension on which is mounted the All-Bander center loaded coil and on top of that the 5-foot whip. The RG58 AU coax lead from the transmitter is routed down through the floor, then through (inside of) the frame of the car and out a hole in the frame near the right rear wheel, then up through the drain plug hole of the spare tire compartment and terminating into the Micro-Z-Match which is on the base of the antenna. The ground lug of the Micro-Z-Match is permanently grounded at this point.

Although initial adjustment of this antenna installation is quite time consuming, it's well worth the efforts when you can see an almost perfect *swr* on all bands.

Power Supply

The transistor power supply MP-1 is 9-1/16″

[*Continued on page 98*]

SCRATCHI [*from page 26*]

Hon. Ed., don't just sitting there. Getting my ad printed reel quick-like. Also post-hasty letting me know if you wanting free hundred-bux deel, and what color you prefering, or are you going to being 1/c stinker and wanting me to paying for ad?

Respectively yours,
Hashafisti Scratchi

SPOT TUNING [*from page 63*]

Broadband 80, 75, and 40 Meters

For operation over the 40 meter band, an ordinary single wire doublet was first installed. This antenna proved to be adequate for covering the band from 7000 to 7300 *kc*. Since this band is only 300 *kc* wide, the antenna is required to work only 150 *kc* either side of the mid-range frequency of 7200 *kc*. This represents 150/7200, or 1/48th, deviation from the resonant frequency. Although this frequency excursion is easily accommodated by the single-wire doublet, subsequent tests indicated the superiority of multi-wire doublets. For this reason, the two-wire doublet (fig. 2) is used for 40 meter operation and comparison checks (with single-wire doublet) indicate gains of two S-units for both reception as well as transmission.

The 3500 through 4000 *kc* (80 and 75 meter) band was not as cooperative as the 40 meter doublet. Various antenna tests have indicated that the average single-wire doublet (coax fed) can accommodate a frequency variation of approximately 1/50th of the resonant frequency. The 500 *kc* band (3500 to 4000 *kc*) required a maximum deviation or QSY of 250/3750, or 1/15th, from the mid-range resonant frequency of 3750 *kc*. Since a single-wire doublet could not accommodate the desired range, I first tried three separate doublets with overall lengths of 130, 125, and 120 feet all connected to the same coax transmission line. An *swr* check produced a roller coaster response across the band. The *swr* was over 4 to 1 on some portions of the band and below 2 to 1 on alternate portions. To achieve a flatter response throughout the band, a triplet or Bowtie array (figure 2B) was tried and proved to be surprisingly successful. For most of the band, the *swr* is below 2 to 1 and the *swr* meter keeps its smile all the way down from 4000 *kc* to about 3550 *kc*. Below that, the *swr* meter's smile gets a little strained when the meter climbs up to 2½ to 1.

Because of the practically flat *swr* response offered by the dual antenna system, it is a real comfort to QSY from band to band and watch the slop jar grin on my *swr* monitor. Using this dual antenna system makes bandhopping with your transmitter almost as easy as with your bandswitching receiver. Without fooling around with time consuming antenna tuning and impedance matching adjustments, changing bands becomes a matter of seconds. Just for my own amusement, I timed myself recently when I bandhopped from 75 meters to 10 meters to answer a Wyoming CQ. Without previous practice in rapid bandhopping, it took me 11 seconds . . . and I got the station.

There is no doubt in my mind that the state of the art will continue to improve and future amateurs will think no more of instantaneous QSY than they will of working the dark side of the moon during Interstellar Space DX Contests. In the meantime, (to get back to earth), some pioneering work is still needed to bring the QSY time down to 5 SECONDS. How about it? ■

HEATH CHEYENNE [*from page 60*]

x 4-3/4" x 5-1/16" and weighs 5½ pounds. It requires 12-14 volts *dc* at 4.5 to 15 amps, depending on load. Total output power is 120 watts CCS or 150 watts ICAS. The load imposed by the MR-1 and MT-1 is 600 Volts at approximately 150 *ma* and 300 Volts at 100 *ma*. The dual output voltage is of course available from the MP-1.

Selection of the best location for mounting the power supply narrowed down to two locations. Under the hood on the firewall and just forward of the right front door above the floor over the fresh air vent. The under hood location was first selected, but after learning a rather expensive lesson, the power supply was relocated over the fresh air vent out of the engine compartment. Everything worked fine, the first call as a mobile in motion was a contact and several hour long QSO's were enjoyed. I dropped by a fellow mobile ham's house to show off the rig and we sat parked for about 1 hour making various antenna adjustments when all of a sudden pph-h-h-t—no high voltage. The fuse was blown on the power supply. Being late at night and no spare fuse available, I went on home, storming at myself for such stupidity There I was with the car parked, engine running for an hour blowing air off the radiator at about 170° F (Thermostat setting) right over the power supply. The Heath manual clearly states the maximum ambient operating temperature should not exceed 122°F. So work and earn and live and learn I did. The two 2N442 transistors on the power supply were replaced along with a new 6146 and 6AU6 tube in the Cheyenne—the power supply was relocated over the fresh air vent by the front seat and everything is fine now and I'm sure we'll encounter no further trouble from overheating the power supply. I should probably add that at that time of failure, several other boners were pulled namely, the transmitter was pulling the full 90 watts on CW (continuously, not keyed)

and at the same time the antenna had become disconnected inadvertently. So all the trouble was caused by boners and not equipment failure. ■

NOVICE [*from page 73*]

and S-85 gear feeding and dipoles on 15 and 40. Mark has a CP also, for 15WPM. DX-wise, it includes 48 states plus KR, KZ, KG, CN8, and PY2.

Wendell Boyden, KN1LWI, 195 Presidents Land, Quincy 69, Mass., would like skeds with K7 are, Colo., N. Dak. and N. Mexico and will sked with anyone needing Mass. Wendell also mentions his 37 states worked on 40 and 80 with the Viking Challenger and HQ-160, plus G5, DL1, OX3, VE, and WP4.

Ted Drake, 1422 Grandview Dr., Tempe, Arizona, received call KN7JOX and went on the air with a DX-40 and SX-99 along with a dipole and Quad for 15 meters. Tom has worked 30/29 for his WAS in 4 months of operation, plus a KR6. He is RCC members and will sked for this or any other reason.

WV6IBX, IFE, and HXM, has formed a joint Novice station at 1201 Tower Grove Drive, Beverly Hills, Calif., and have a DX-40, DX-20, an SX-28 and numerous other pieces of equipment. The boys will be active on 80, 40, 15, and 2 meters and will make skeds for any reason.

Jack Ray, KN4MZW, 412 W. 4th St., Tompkinsville, Ky., writes to say he operates with a DX-20, S-38E, and Q Multiplier with a multiband dipole. In less than 3 months Jack has a WAS 22/18.

Well, as happens every month, that cleans out the Novice file. Don't forget to keep those letters and pictures coming this way. And if you would like help with your license, drop a postal card to the address at the head of the column. Within 90 days your name will appear in the help wanted section. For now—

73, De Don, W6TNS

DX [*from page 69*]

100-SM5

V. C. R. S. in Vasteras issues also the award 100-SM5. For this award you have to work 100 SM5-or-SL5 stations on any or all bands after the War. Send a list (NO QSL) with the call, date and type (CW or FONE). Your list must be checked and signed by any club or amateur. You can get 100- SM5-award on CW or FONE. Send your application to SM5WI, Harry Akeson, Vitmaragatan 2, Vasteras, Sweden. The cost is 1 U.S. dollar or 13 IRC.

100-SM

V. C. R. S. issues the award 100-SM. For this award you have to work 100 SM-stations on any or all bands after the War. Send a list (NO QSL) with the call, date, and type (CW or