

The Heathkit HA-14 "Kw Kompact" S.S.B. Linear Amplifier is small enough to permit its placement on top of the SB-400 exciter or on a mobile transceiver such as the Heathkit HW-12.



CQ Reviews:

The Heathkit HA-14 "KW Kompact" Linear Amplifier

BY WILFRED M. SCHERER,* W2AEF

A GALLON in a "pint-size" container! Impossible? Figuratively speaking the answer is no, particularly when it comes to the Heathkit HA-14, a real "KW Kompact" that packs a kilowatt into a case only 3-3/16" high $\times$ 12-3/16" wide $\times$ 10" deep. Its small size and shape factor are such that make it ideal for mobile installations for which it has been especially designed or for fixed-station use set on top of an exciter.

Other features of the HA-14 include: class B operation with grounded-grid circuitry using two 572B (or T160-L) triodes connected in parallel; bandswitched coverage of all the amateur bands 10 through 75 meters; fix-tuned 50-ohm input circuit; pi network with output impedance fixed for 50-75 ohm loads; built-in s.w.r. bridge metered to read relative forward power or s.w.r.; a.l.c. bias for automatically controlling drive from the exciter; instant automatic switching between exciter and linear amplifier outputs using built-in changeover relay; full 1 kw p.e.p. input with 100 watts drive that produces up to 600 watts output for a power gain of 6, or almost 8 db. External power is used for which there are two separate power supplies. One is a transistorized type for mobile 12 v.d.c. operation, the other is for use with 120/240 v. 60-cycle a.c.

Circuitry

A diagram showing the basic elements of the circuitry is given at fig. 1. R.f. drive is applied to the filaments of the two class-B triodes from a fix-tuned broadband impedance-matching network consisting of L_1 and C_1 , the values of which are switched as needed for the various bands.

The output circuit is a pi-network which is tuned to resonance with C_3 , while fixed loading capacitors are used at C_5 and C_6 . C_4 and C_5 are

switched in only for 80-meter operation and L_2 is tapped for the various bands.

The r.f. circuits are switched with a d.p.d.t. antenna-changeover relay which is operated by the v.o.x. relay in the exciter. Operation is as follows: During receive, a bias of -120 volts is applied to the tube grids through the relay coil. The bias cuts off the plate current to eliminate the generation of tube hash which might be heard in the receiver. The relay is not energized, because the exciter-relay contacts are open and the tube grids draw no current through the relay coil. During this condition, the antenna is connected through the normally-closed relay contacts to the r.f. input from the exciter. This allows signals to be received (it is assumed that the exciter is a transceiver, but where a separate receiver and a transmitter are used, it is further assumed that another separate antenna-changeover relay already is in use for switching the antenna between the receiver and the transmitter). During transmit, the contacts on the v.o.x. relay in the exciter ground the bottom end of the relay coil and thus energize the relay from the -120-volt bias source. The normally-open contacts then close, connecting the exciter output to the r.f. input of the linear and transferring the antenna to the linear output.

At the same time, the resistance of the relay coil and R_5 form a voltage divider, with the current drawn through the circuit producing a potential drop of -2 volts across R_5 . This voltage is used as operating bias for the class-B tubes.

When the power switch on the HA-14 is turned off, there is no bias voltage to operate the changeover relay, so the antenna remains connected directly to the exciter for normal low-power operation without the linear. The 572-B's have instantaneous-heating filaments, so linear-

*Technical Director, CQ.

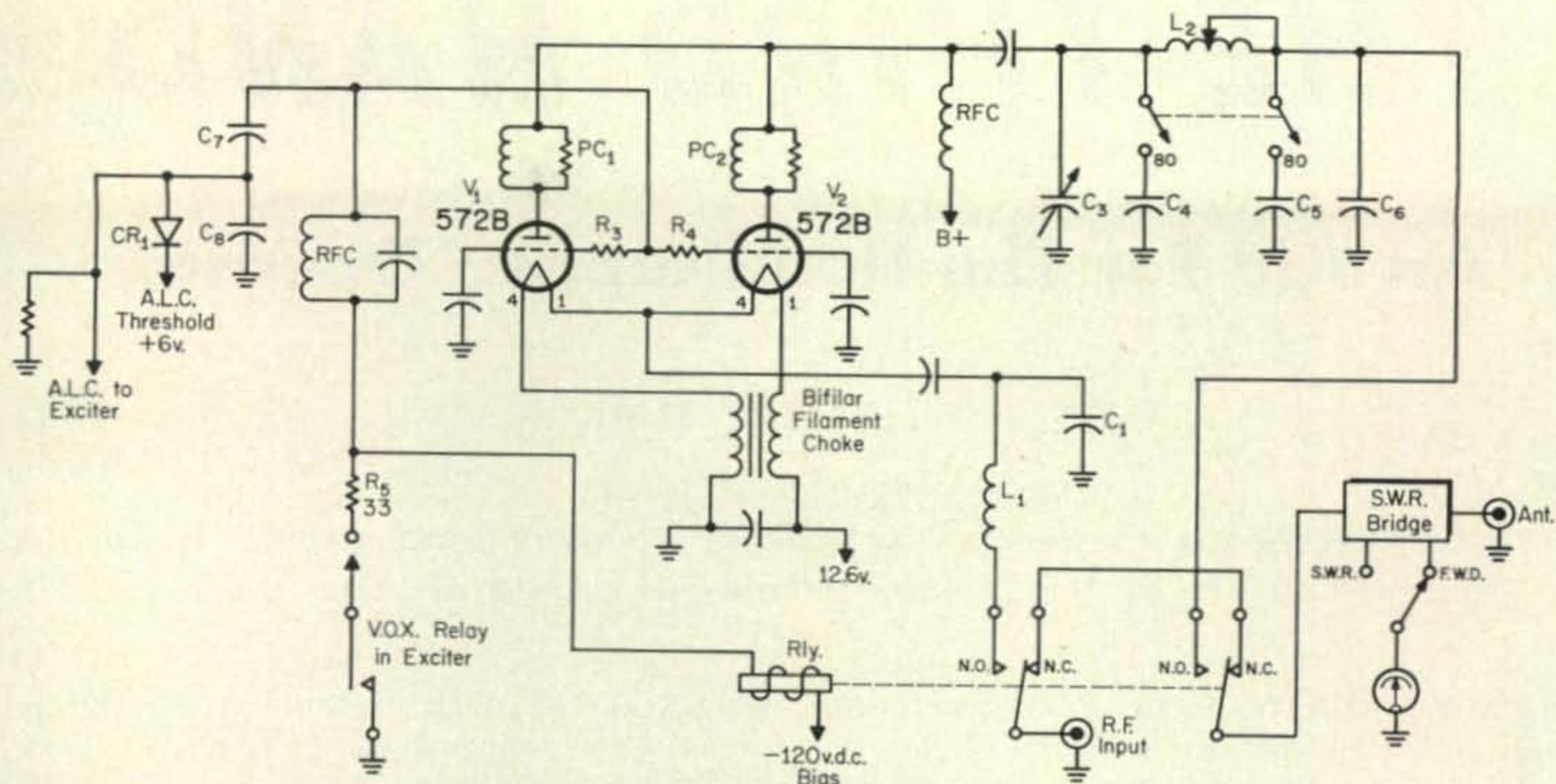
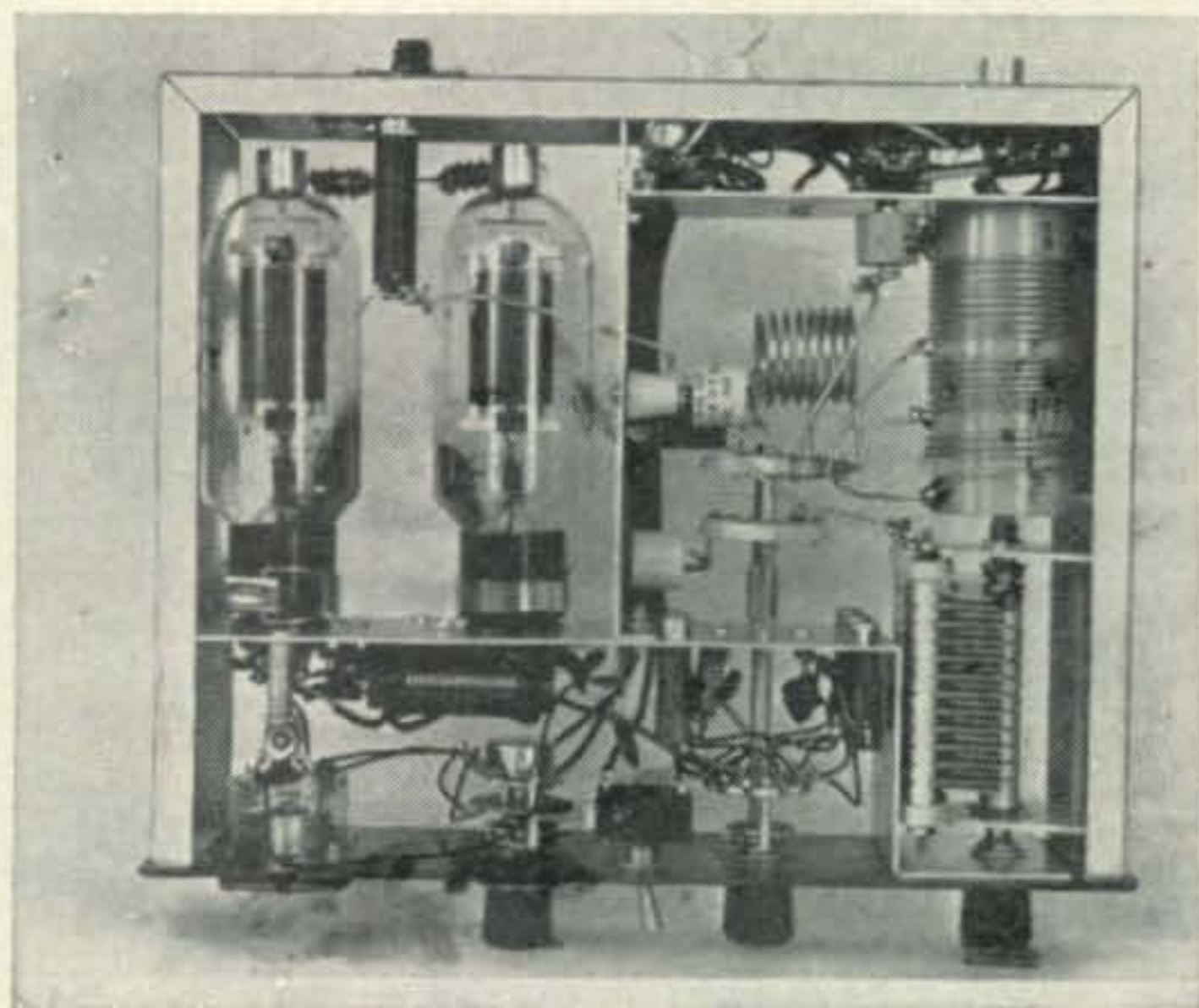


Fig. 1—Basic circuit of the Heathkit HA-14 linear amplifier.

amplifier operation may be had as soon as the power switch is turned on, making it possible to immediately switch back and forth between low-power from the exciter or high power from the linear.

A.l.c. is obtained by taking some of the r.f. voltage that appears at the tube grids during modulation and applying it to a diode rectifier from a capacitive voltage divider, C_7 - C_8 . The rectified r.f. voltage is then fed back as a d.c. control bias to the a.l.c. input of the exciter. This arrangement can be set so that the a.l.c. takes hold *before* any flattopping occurs and is done by fixing a threshold level with a positive d.c. potential of about 6 volts which is obtained from an output-voltage-divider tap in the power supply. This is unlike the usual a.l.c. system in a class AB₁ amplifier wherein some grid-current flow (with attendant flattopping) is required before the a.l.c. operates.



Interior view of the HA-14. Open-frame construction permits good accessibility and excellent ventilation. The bifilar-wound filament choke is below the shelf near the right tube socket.

The s.w.r. bridge is an "in-line" reflectometer-type using a piece of coaxial cable with its shield removed and the two pick-up loops inserted through it.

Construction

Instead of employing the customary chassis-type of construction, the HA-14 is built with an open-frame and shelf arrangement which makes possible the small size and the advantageous shape factor, allows good accessibility to components¹ and provides excellent ventilation which is further enhanced by perforations on all sides of the wrap-around case.

The tubes are securely held in place with ring clamps at their sockets. On the rear apron an SO-239 coax connector is provided for the antenna, a phono-type jack for the r.f. input and a 12-prong Jones connector (with locking clamps) for a.l.c., exciter v.o.x.-relay contacts, and all the power leads except the high-voltage input which is a screw-on type high-voltage terminal.

The unit sent to us for evaluation was already assembled and wired, but after perusing through the assembly manual, we envisioned no difficulties in construction and we've estimated that the work requires 12-15 hours of time.

Power Supplies

Operation of the HA-14 requires 2000 v.d.c. at 500 ma peak, -120 v.d.c. at 60 ma and 12.6 volts a.c. or d.c. at 4 amperes. This power is available from the HP-24 120/240 v.a.c. supply or from the HP-14 12 v.d.c. mobile power unit.

The current drain with 13 v.d.c. input is rated at 25 a. average, 50 a. peak. The latter appears to be low, inasmuch as 1000 watts peak input

[Continued on page 101]

¹Except at the power-plug connections where it's a bit of a tight squeeze.

We always welcome technical tips to pass on to our readers. When your item appears it is read by thousands of readers and *you* help those interested in the same fine hobby as yourself—amateur radio.

Until next month then, our Valentine greetings to you.
73 and 75 Chuck, W6QLV

Contest Calendar [from page 85]

quencies and give the gals a few contacts.

W5RZJ, Louisa gave all the details in her column last month.

B E R U

Starts: 0001 GMT Saturday, March 19.

Ends: 2359 GMT Sunday, March 20.

This activity in its 29th year is sponsored by the RSGB and is open to stations in the British Commonwealth only. This announcement therefore is directed to our Canadian friends and other British areas.

You can write to me for a copy of the rules. Log sheets and rules are available from the RSGB on request.

Contest entries must be postmarked no later than April 12th and they go to: RSGB Contest Committee, 28 Little Russell Street, London, W.C.1, England.

Editors Notes

Conditions for the c.w. section of our contest were somewhat disappointing. Although WWV was sending N6 most of the week-end the MUF evidently did not reach 28 mc. Unlike the phone week-end when we had some surprisingly good openings on 10, the band was absolutely dead on c.w.

As in the past the 20 meter band carried most of the load, with 15 doing its share the short time the band was open to Europe. After that it was hunting around for additional multipliers. The lower frequency bands 40, 80 and even 160 showed their share of activity during the favorable hours to the respective bands.

This year I decided to give all bands a go so as to get a better picture of what was going on, and W1WY finally worked his first JA on 40, at 7 A.M. local time. A telrex inverted V did the trick.

We are happy to see many new calls and first timers in the incoming logs. Most of the old stand-bys were in there, especially in the multi-operator divisions where there was some keen competition.

Also heard were the usual "muscle-flexers" and "I'm only looking for new countries" guys, who never have the courtesy of sending in a report. It has always been a revelation to us to receive logs with only a handful of contacts from stations in far away Japan but nothing from our own W/K stations whom we know made scores of contest contacts.

I wonder if all that activity and those "rare new ones" would be there to work if it was not for the activity created by the contest.

73 for now, Frank, W1WY

Heathkit HA-14 linear [from page 53]

would require about 1200 watts (assuming 90% efficiency), or approximately 90 a. at 13 volts; however, the basic theory of what takes place here is that the switching transistors tend to cease operation when the current reaches 50 amperes. The additional peak-current requirements are then supplied by the voltage to which the high-capacitance filter which is charged when the current demand is low and the voltage is high, which occurs during the time between s.s.b. modulation peaks.

In any event, a husky alternator-type battery-charging system is recommended with a 50-ampere battery for mobile operation where the additional current drain of the exciter also must be considered. Then too, don't forget that it may be necessary to use the headlights or other car accessories at the same time!

Performance

We were quite surprised to see how well this little package really performed. Using the a.c. power supply with 120 volts input under full load, 100 watts of steady drive produced a d.c. input to the linear of one kilowatt with an output of 600-550 watts, depending on the band used. With s.s.b. modulation the p.e.p. ran to a little under 1200 watts input and to 700 watts output (slightly less on 15 and 10 meters).

Due to low filament voltage (during full load) from the original HP-24 a.c. power supply which was furnished with the amplifier, it was not possible to realize the aforementioned power capabilities. A drop of .25 volts in each filament-supply lead in the 10-foot cable to the power supply also contributed to inadequate filament voltage. The power transformer deficiency has since been corrected by the manufacturer, but in any event, it is recommended that the leads to the power supply be made no longer than absolutely necessary.

Due to the current-limiting action that takes place in the 12 v.d.c. supply during use as mentioned earlier, the amplifier cannot be driven to a steady d.c. input of more than 400-500 watts and reliance must be made on the filter capacitors to supply the 1 kw peak s.s.b. power. The rated peak power actually was obtainable with normal voice modulation, as measured during our tests while using the mobile supply; however, excess use of a.l.c. either at the exciter or from the linear will hold down the peak power, inasmuch as the filter capacitors then cannot charge up sufficiently due to the greater average power demand.

The Heathkit HA-14 "KW Kompact" Linear Amplifier is a little package with a mighty wallop at a cost of \$99.95 for the kit. The HP-24 a.c. power supply kit is \$49.95 and the HP-14 12. v.d.c. model is \$89.95. They are products of the Heath Company, Benton Harbor, Michigan.—

W2AEF