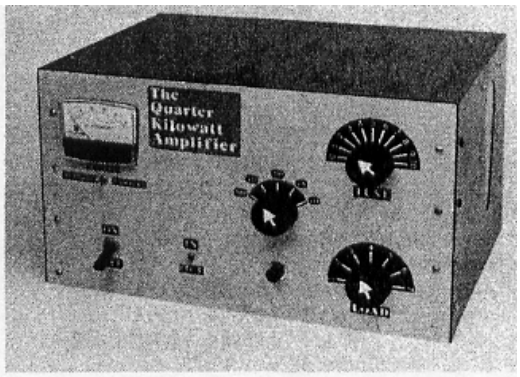

Fig. 70 — The completed quarter-kilowatt amplifier.

The Novice "1/4 Gallon"

Most Novice class licensees own transmitters that are not capable of running the maximum legal-power input for that class license — 250 watts. This amplifier was designed primarily with this in mind. Approximately 25 watts of power are required to drive the amplifier to 165-watts output on 80 meters. If a 75-watt transmitter is used to drive the amplifier, the transmitter output should be reduced to a level just sufficient to drive the amplifier to its full-power input. This can usually be accomplished by lowering the drive to the transmitter output stage and re-loading.

The Circuit

The main ingredient in this amplifier is a pair of 6KD6 television-sweep tubes (see Fig. 71). Although the tubes are rated at 33 watts of plate dissipation, they can handle temporary overloads of at least 100 watts without sustaining permanent damage. These tubes were chosen over 8lls or 572Bs because they can often be "liberated" from old television sets or can be purchased new from most TV service shops.

VR1, an 11-volt Zener diode, provides cathode bias for the tubes and establishes the operation as Class B. That class of amplifier requires less driving power than does a Class C stage for the same power output. It is easier to reduce the output from a transmitter that has more than enough power to drive the amplifier than it is to boost the output from a transmitter that provides insufficient drive. Class B operation was chosen for that reason.

The power supply uses an old TV-set transformer that has three secondaries: 600, 6.3 and 5.0 volts. The 600-volt winding supplies the full-wave bridge rectifier with AC energy. DC output from the rectifier assembly is filtered by means of three 330-uF capacitors. The 47-kΩ resistors across each of the capacitors equalize the voltages across the capacitors and drain the charge when the power supply is turned off. Equalizing resistors are used across each of the diodes to ensure that the reverse voltage will divide equally between the two diodes in each leg. The capacitors across each diode offer spike protection. Each 6KD6 draws 2.85 amperes of filament current. Both filaments are connected in parallel across the 6.3-volt transformer winding. The 5-volt winding is connected in series with the 6.3-volt winding; the total (11.3 volts) is rectified, filtered, and used to power the relay.

A 0-50-μA meter is used to measure the plate voltage and current. The meter reads 0-1000 in the plate-volts position and 0-500 mA in the plate-current position. A 0.26-ohm shunt is placed in the high-voltage lead to facilitate metering of the plate current. One should be careful if working near the meter with the power on, as full plate potential will be present between each of the meter leads and ground. *Caution: Turn off and unplug the amplifier before making any changes or adjustments.*

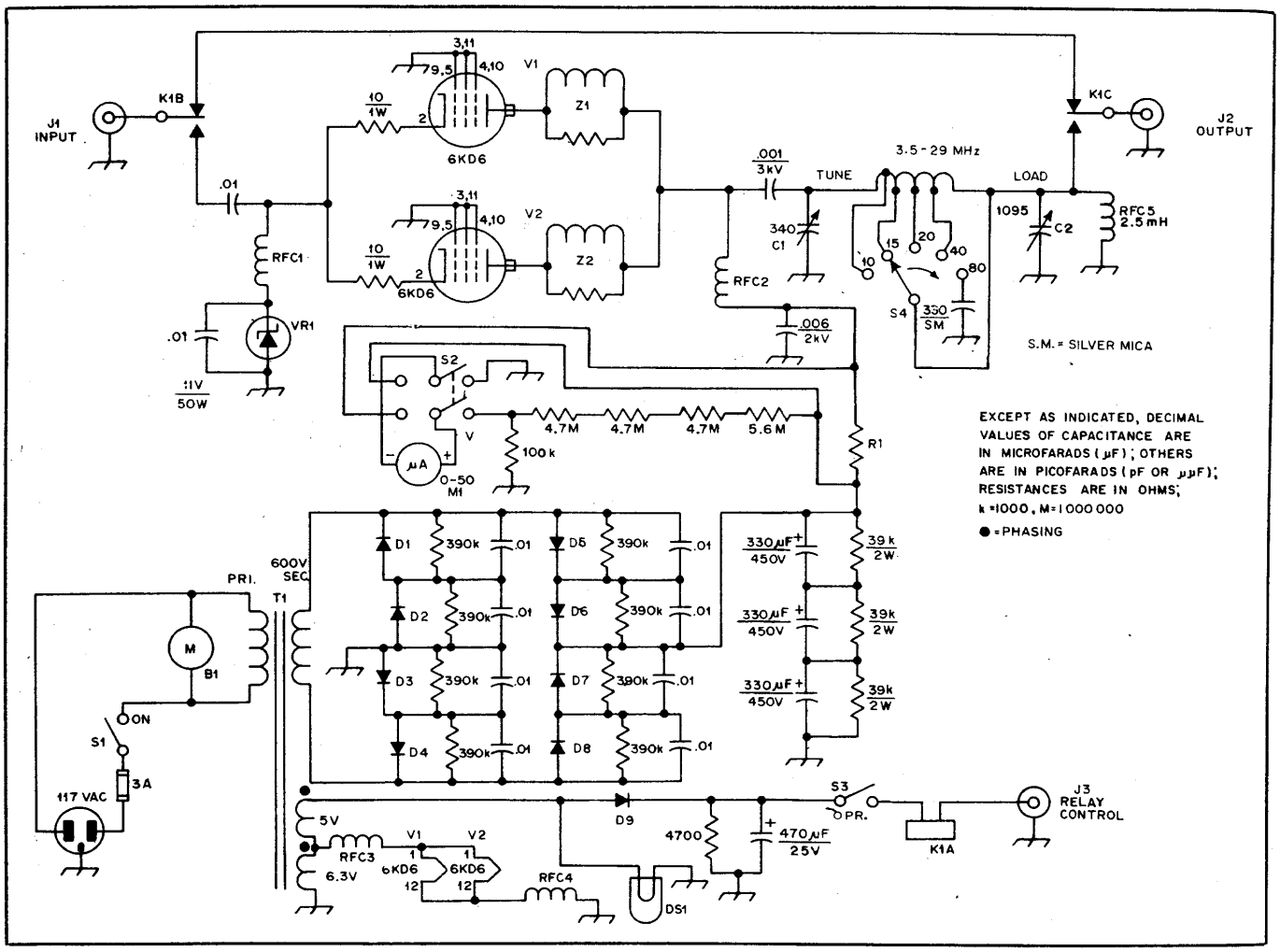

Fig. 71 — Schematic diagram of the 1/4-kilowatt amplifier. Resistors are the 1/2-watt composition type unless otherwise specified. Fixed-value capacitors are disk ceramic unless otherwise noted. Polarized capacitors are electrolytic.

B1— 117-Vac blower.
C1 — Variable capacitor, 340-pF maximum, (Millen 19335 or equiv.)
C2 — Variable capacitor, 1095-pF maximum (surplus 3-section 365-PF variable).
D1-D8, incl. — Silicon diodes, 1000 Volt, 2 A.
D9 — Silicon diode, 50V, 1A.
DS1 — Pilot lamp assembly, 12 V.
VR1 — Zener diode, 11 V, 50 W.
J1, J2 — Coaxial connector, SO-239
J3 — Connector, phono type.
K1 — Dpdt relay, 12-V field, 2.A contacts.
L1 — 18 turns B & W 3022 coil. The entire coil is used for 80 meter operation and is tapped for the other bands as follows: 7-1/2 turns for 40 meters; 13-1/2 turns for 20 meters; 14-1/2 turns for 15 meters; 15-1/2 turns for 10 meters. Turns are measured from C2 end of coil.

M1 — Panel meter 0-50μA Calectro D1-910 or equiv.
R1 — Meter Shunt, 10 feet (3.048m) no.24 enam. wire wound on a large Ohmic value 2-watt composition resistor.
RFC1 —20 turns no.24 enam. wire on an Amidon FT-82-72 core.
RFC2, RFC5 — Rf choke, 2.5 mH, 500 mA.
RFC3, RFC4 — 15 turns no. 14 enam. wire on an Amidon FT-82-72 core.
S1 — Spst toggle switch, 4 A.
S2 — Dpdt toggle switch, low current type.
S3 — Spst toggle swjtch, low current type.
S4 — Single-pole, 6-position ceramic rotary switch, single-wafer type
T1 — Television transformer (see text)
Z1, Z2 — 5 turns no. 18 enam. wire on a 47-ohm 1 -watt resistor.

Construction

Perhaps the best way to classify this amplifier, would be to call it a "junker type" amplifier. Every attempt was made to keep the amplifier as simple and easy to build as possible. The only critical values are those for the amplifier plate-tank circuitry. Reasonable parts substitutions elsewhere in the circuit should have little or no effect on the performance of the amplifier. For example, if 330-µF filter capacitors are not available, 250-µF or 300-µF units could be substituted. They should be rated at 450 volts or greater to provide a margin of safety. If a 0.001-µF plate-blocking capacitor is not on hand and a 0.005-µF unit is, use it. Builders often attempt to match parts exactly to the type specified in a schematic or parts list. A few projects are this critical in nature, but the majority, including this one, are not.

The transformer used in this amplifier was garnered from an old TV set. Any hefty transformer with a high-voltage secondary between 550 and 700 volts should be adequate. Most of these transformers will have multiple low-voltage secondaries suitable for the tube filaments and relay requirements.

The chassis used to house the amplifier happened to be on hand and measured 3 X 10 X 14 inches (76 X 254 X 356 mm). No doubt the amplifier could be constructed on a smaller chassis. The beginner is cautioned not to attempt to squeeze too much in too small a space.

The front, rear, side and top panels are constructed from sheet aluminum and help to keep the amplifier "rf tight." Any air-flow openings are "screened" with perforated aluminum stock. The front-panel meter opening is shielded by means of an aluminum enclosure (a small Minibox would serve quite nicely). The on-off power switch, pilot light, meter switch, band switch, tuning and loading controls, and amplifier in-out switch are all located on the front panel. On the rear panel are the amplifier input and output connections, relay control jack and the fuse holder. As can be seen from the photograph, a fan is located near the tube envelopes to keep them cool during operation.

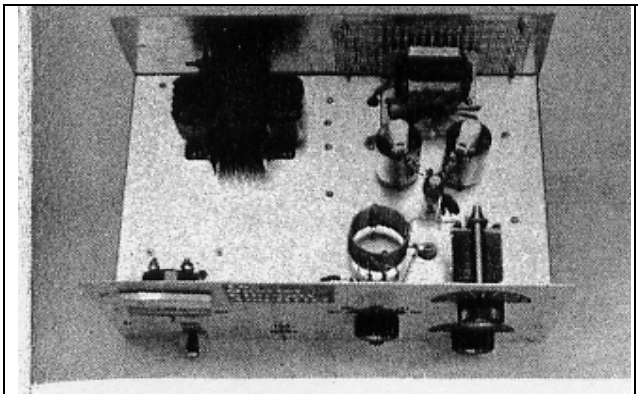

Fig. 72 — An inside view of the amplifier. C1 is located at the lower right. C2 is mounted below the chassis and is connected to L1 using a feedthrough insulator.

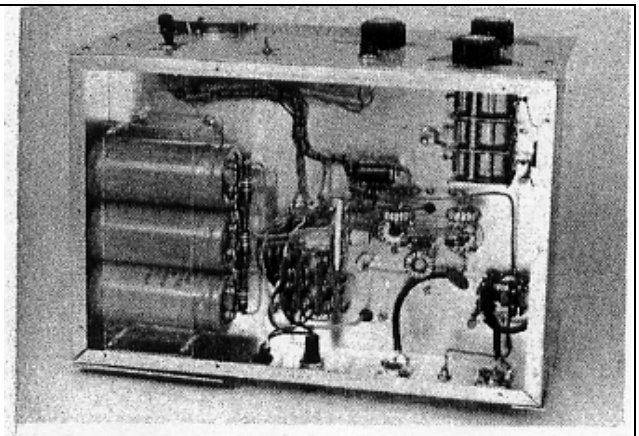

Fig. 73 — Underside of the amplifier. Component layout is not particularly critical.

Setup** and **Operation

Attach the transmitter output to the amplifier input connection. Then, join the output of the amplifier to a 50-ohm noninductive dummy load. Connect the relay control line to the transmitter or external antenna-relay contacts. Then plug in the line cord and turn the power switch to the ON position. With the meter switch in the PLATE VOLTS position, the reading on the meter should be approximately 425, which corresponds to 850 volts. If the power transformer used has a high-voltage secondary other than 600 volts, the reading will vary

accordingly. If no plate voltage is indicated by the meter, check your wiring for possible errors or defective components. Next, place the meter in the PLATE CURRENT position, the band switch to the 80-meter band, and apply a small amount of drive to the amplifier — enough to make the meter read 50-mA (5 on the meter scale). With the plate-tank loading control fully meshed, quickly adjust the plate tuning capacitor for a dip in plate current. Apply more drive (enough to make the meter read 100-mA), advance the loading control approximately one-eighth turn and readjust the plate tuning control for a dip in the plate current. Continue this procedure until the plate-current maximum dip is approximately 300 mA. The final value of plate current at which the amplifier should be run depends on what the plate voltage is under load. In our case this value was 800 volts. Therefore, the amount of current corresponding to 250 watts input is approximately 310 mA. (I = P/E, I = 250/800, I = 312.5 mA.) The same tune-up procedure should be followed for each of the other bands. The amplifier efficiency on 80 through 20 meters is approximately 65 percent, dropping to 60 percent on 15 meters. On 10 meters, efficiency is slightly less than 50 percent. Poor efficiency on the higher bands is caused primarily by the high-output capacitance characteristics of sweep tubes.