

*Pun*ningham RADIO TUBES

C-299, CX-299 and CX-220 3.3 VOLT FILAMENT TUBES

The C-299, CX-299 and CX-220 are a group of tubes designed for operation on dry cells. These tubes have thoriated tungsten filaments rated at 3.3 volts, 0.63 amperes and although intended for operation on three No. 6 dry cells, may be used with two lead cells or three Edison cells if necessary.

C-299 and CX-299 DRY CELL GENERAL PURPOSE TUBES

The C-299 and CX-299 are general purpose tubes designed for use as detectors or amplifiers. These tubes are identically the same except for the bases. The CX-299 has a small standard base and the C-299 has a special type base.



With any method of battery supply used, a filament rheostat should be provided to maintain constant voltage across the filament, as the life is greatly shortened by excessive voltage. When one tube is used the rheostat should be about 60 ohms, and when three tubes are operated in parallel from three dry cells in series, the rheostat should be about 20 ohms.

Circuit Recommendations

AS A DETECTOR

When these tubes are used as detectors with grid leak and condenser, the plate voltage should preferably be not more than 45 volts. The grid condenser should be about .00025 mf. and the grid leak should have a resistance of 2-9 megohms, the latter value giving greater sensitivity on very weak signals but with somewhat inferior fidelity. The grid return should be connected to the positive side of the filament.

AS AN AMPLIFIER

When these tubes are used as amplifiers a grid bias should be



CX-220

DRY CELL POWER AMPLIFIER

The CX-220 is a special purpose tube designed for operation as a power amplifier on dry cells. It is intended for use only in the last stage of an A.F. amplifier. The filament is of the thoriated tungsten type and is rated at 3.3 volts and 132 milliamperes.

Circuit Recommendations

A rheostat of at least 15 ohms should be used to maintain a constant voltage across the filament as its life may be greatly shortened by excessive voltage.

The recommended maximum plate voltage for this tube is 135 volts with a grid bias of 22.5 volts. A slight reduction in plate voltage will not cause undue distortion but the output will be decreased somewhat. It is important that the grid-bias battery voltage be maintained at the recommended value or the life of the tube may be shortened due to excessive plate current caused by a decreased grid-bias.

It is not necessary to use an output transformer with this tube and a cushion or spring mounting need not be provided when it feeds directly into a loud speaker.

RATING

Filament Voltage	3.0-3.3 volts
Filament Current	0.125-0.132 amperes
Plate Voltage (maximum)	135 volts

AVERAGE CHARACTERISTICS

Plate Voltage	90	135 volts
Grid Bias Voltage	-16.5	-22.5 volts
Amplification Factor	3.3	3.3
Mutual Conductance	415	525 micromhos
Plate Resistance	8000	6300 ohms
Plate Current	3	6.5 ohms
Undistorted Power Output	45	110 milliwatts

DIMENSIONS

Maximum Overall Length	4 $\frac{1}{8}$ "
Maximum Overall Diameter	1 $\frac{3}{16}$ "
Base	Small CX

AVERAGE CHARACTERISTIC CURVES

(Pages 13 and 14)

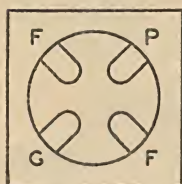
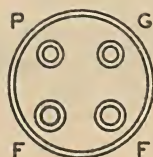
Filament Characteristic—Fig. 6 shows the change of filament current with various filament voltages.

Plate Characteristics—Fig. 8 shows the relation between the plate current and plate voltage at various bias voltages.

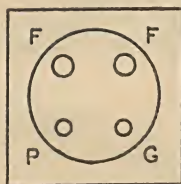
Mutual Characteristics—Fig. 7 shows a family of grid voltage-plate current curves at various plate voltages.

Dynamic Characteristics—Fig. 9 shows the effect of grid voltage upon the amplification factor, mutual conductance and plate resistance.

Output Characteristic—Fig. 10 shows the undistorted power output obtainable at various load resistances.



C-299



CX-299
and
CX-220

BASE AND SOCKET CONNECTIONS

CX-220

AVERAGE CHARACTERISTICS

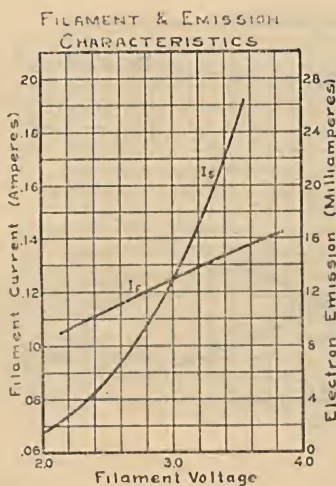


Fig. 6

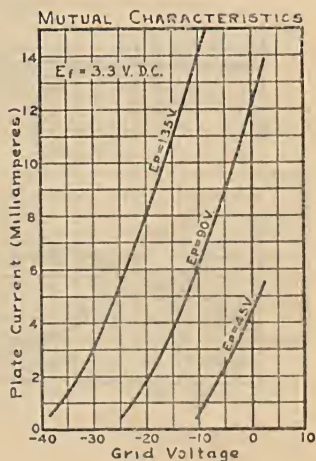


Fig. 7

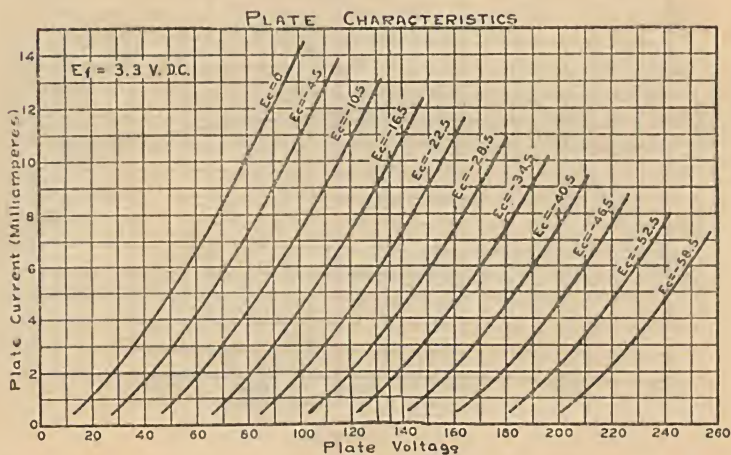


Fig. 8

CX-220 AVERAGE CHARACTERISTICS

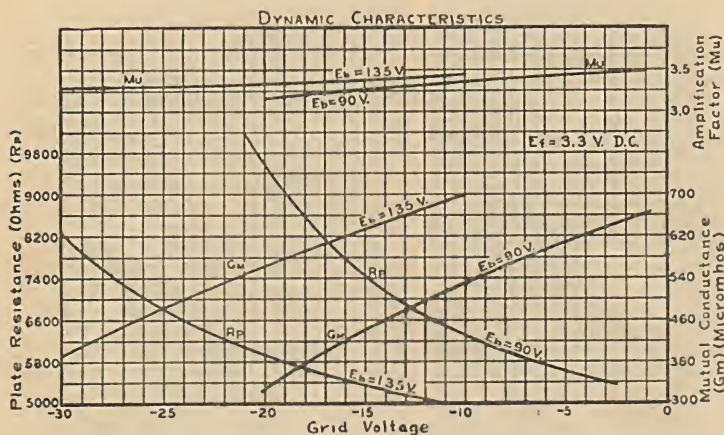


Fig. 9

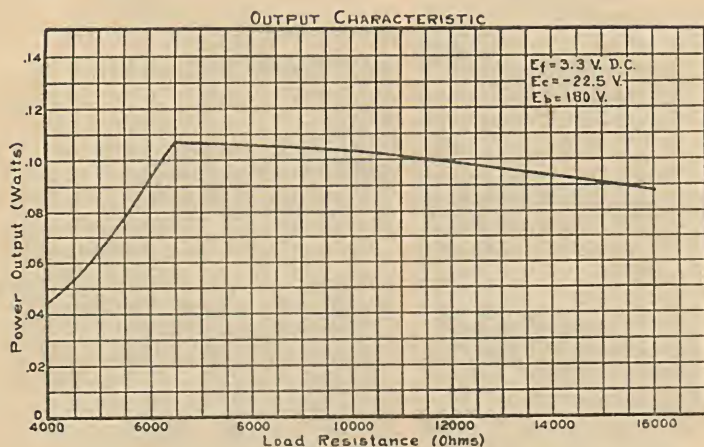


Fig. 10