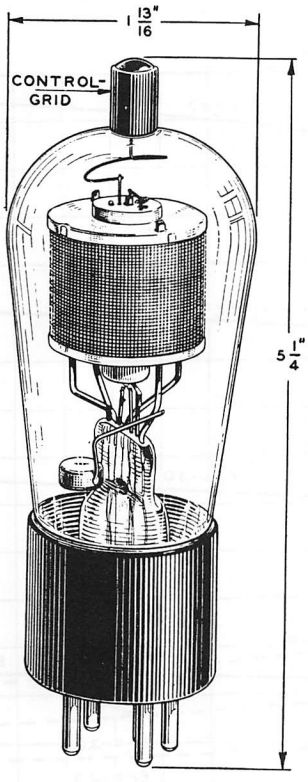
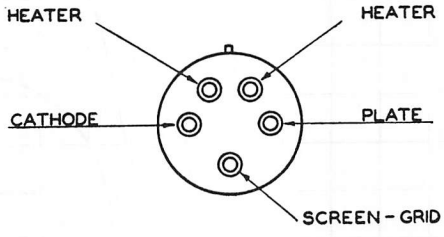
259A Vacuum Tube





Classification

The No. 259A Vacuum Tube is a four-element, screen-grid tube having an indirectly heated cathode which permits operation of the heater element directly on alternating current. The tube is for use as a screened grid, high-frequency amplifier, but also may be used as a detector or audio-frequency voltage amplifier.

Base and Socket

The No. 259A Vacuum Tube employs a standard five-prong base suitable for use in a Western Electric No. 134A (cushion) or No. 137A (rigid) Socket or similar type socket. The arrangement of electrode connections to the base terminals is shown above. The control-grid terminal is located at the top of the bulb and is arranged for a special, quick-release connector.

Rating and Characteristic Data

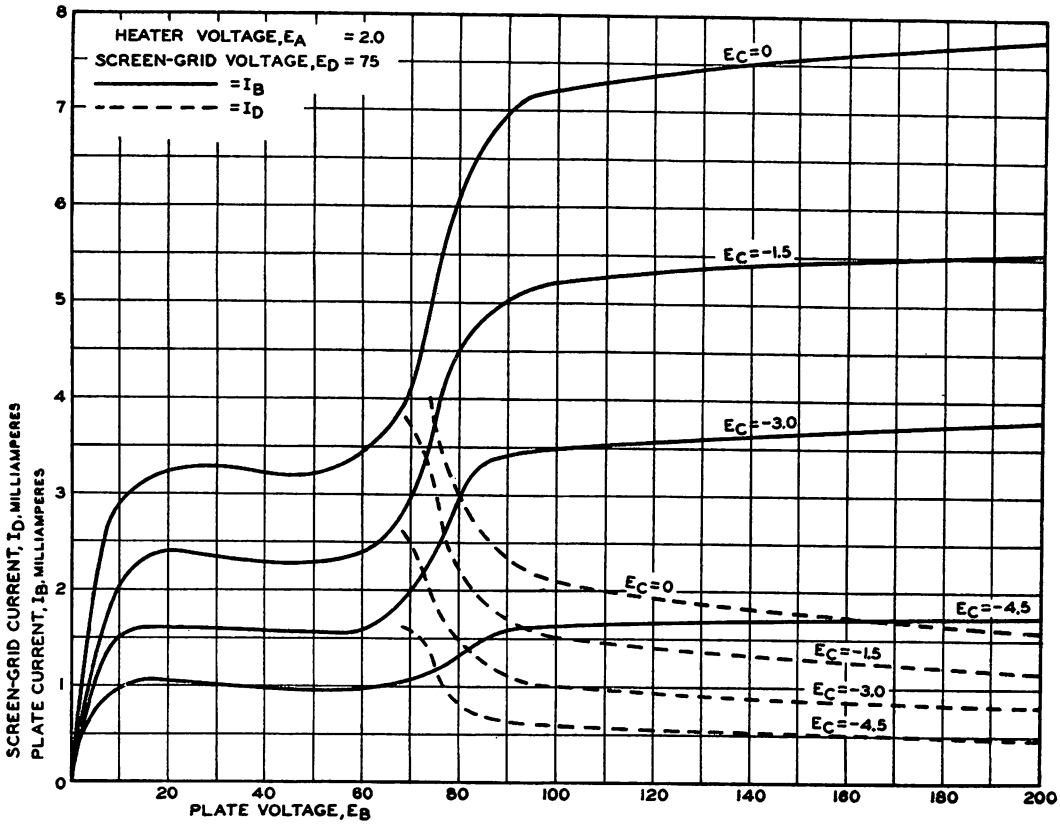
Heater Voltage		2 Volts, AC or DC
Average Heater Current		1.60 Amperes
Plate Voltage	180	180 Volts
Screen-Grid Voltage	75	90 Volts Maximum
Control-Grid Voltage	—1.5	—1.5 Volts
Average Plate Current	5.5	7.5 Milliamperes
Average Plate Resistance	400,000	320,000 Ohms
Average Mutual Conductance	1,380	1,500 Micromhos
Average Amplification Factor	550	480

Approximate Direct Interelectrode Capacities

Plate to Control-Grid	0.004 MMF
Control-Grid to Heater, Cathode and Screen-Grid	5.8 MMF
Plate to Heater, Cathode and Screen-Grid	14.0 MMF

Average Static Characteristics

The accompanying curves give the average static characteristics of the No. 259A Vacuum Tube.



General Features

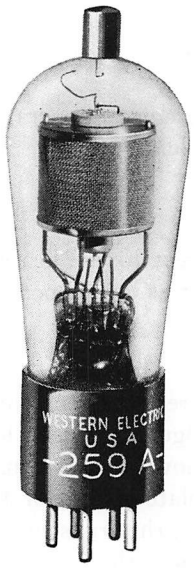
The No. 259A Vacuum Tube employs an extra grid or a screen which provides an electrostatic shield between the plate and control grid. Such internal shielding eliminates the necessity of neutralization to prevent unwarranted oscillation or feed-back if the rest of the circuit elements are properly shielded.

The structure has been so designed as to give an unusually high mutual conductance for a tube of its rating, thereby making possible a comparatively high amplification.

The cathode is designed to provide a very large electron emission compared with the space current drain, thus assuring the maintenance of uniform electrical characteristics over a long life.

Western Electric

259A Vacuum Tube



Classification—Voltage amplifier, screen-grid tetrode with indirectly heated cathode

Applications

Screen-grid high frequency amplifier.

Audio-frequency amplifier. Where exceptionally low tube noise is required the 259B tube is preferable.

Detector.

Dimensions—Dimensions, outline diagrams of the tube and base, and the arrangement of the electrode connections to the base terminals are shown in Figures 1 and 2.

Base—Medium, five-pin type with bayonet pin. Small metal cap control-grid terminal at the top of the bulb.

Socket—Standard, five-contact type such as the Western Electric 141A socket.

Mounting Positions—The 259A tube may be mounted in any position.

Average Direct Interelectrode Capacitances—

Control grid to plate	0.004	μμf.
Control grid to heater, cathode and screen-grid	5.8	μμf.
Plate to heater, cathode and screen-grid	14	μμf.

Heater Rating

Heater voltage	2.0 volts, a.c. or d.c.
Nominal heater current	1.60 amperes

The heater element of this tube is designed to operate on a voltage basis and should be operated at as near the rated voltage as practicable.

Cathode Connection—Preferably direct to the heater. If voltage must be applied between the heater and cathode, it should be kept as low as possible and should never exceed 90 volts.

Characteristics—Plate current and screen-grid current characteristics of a typical 259A tube are given as functions of plate voltage in Figures 3 and 4 for screen-grid voltages of 75 and 90 volts, respectively. The same quantities are shown as functions of control-grid voltage in Figures 5 and 6. Transconductance characteristics for a plate voltage of 180 volts are shown in Figure 7. For other plate voltages between 135 and 250 volts, the transconductance of a typical tube for values higher than 100 micromhos does not differ by more than ± 3% from its value at 180 volts. The amplification factor and plate resistance characteristics corresponding to Figure 5 are given in Figures 8, 9, 10, and 11.

Typical Operating Conditions

Plate Voltage Volts	Screen-Grid Voltage Volts	Control-Grid Voltage Volts	Plate Current Milliamperes	Screen-Grid Current Milliamperes	Amplification Factor	Plate Resistance Ohms	Transconductance Micromhos
135	75	−1.5	5.3	1.4	400	300,000	1,330
180	75	−1.5	5.5	1.2	550	400,000	1,380
*180	90	−1.5	7.5	1.7	480	320,000	1,500
*250	75	−1.5	5.7	1.1	610	430,000	1,420

*Maximum operating conditions.

Circuit Requirements—In order to make use of the high gain per stage which is obtainable with the 259A tube, special precautions must be taken in high-frequency, multi-stage amplifiers to eliminate feed-back in the associated circuit. In order to do so effectively, it is usually necessary to use shielding between successive stages, a close fitting shield around each tube, and a resistance or choke coil in the screen-grid lead of each tube. When such an impedance is used in the screen-grid lead, a low impedance condenser should be connected from the screen-grid to the cathode. Impedances common to two or more plate or grid circuits should be avoided.

The screen-grid voltage should be obtained either directly from a low resistance source or from a voltage divider. The use of a series resistance to reduce a high voltage supply to the desired value is not recommended because screen-grid currents differ widely in different tubes and vary during life in individual tubes.

Microphonic Noise—With a plate voltage of 180 volts, a screen-grid voltage of 75 volts, a control-grid bias of −1.5 volts, and a load resistance of 100,000 ohms, the mean microphonic noise output level of the 259A tube measured in a laboratory reference test set is 20 db below 1 volt. The range of levels of individual tubes extends from 2 to 36 db below 1 volt. Since microphonic noise output depends on the type and intensity of the mechanical disturbance which produces it, the values given here are useful chiefly for comparison with the levels of other tubes which have been tested in the same way.

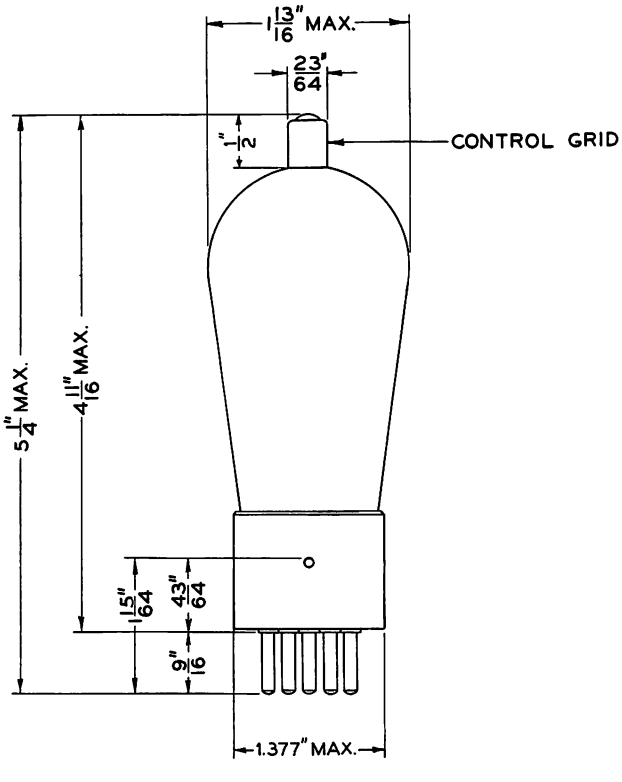


FIG. 1

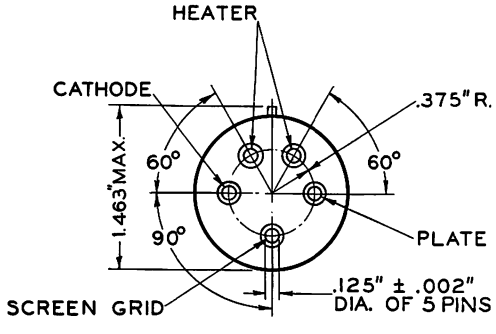


FIG. 2

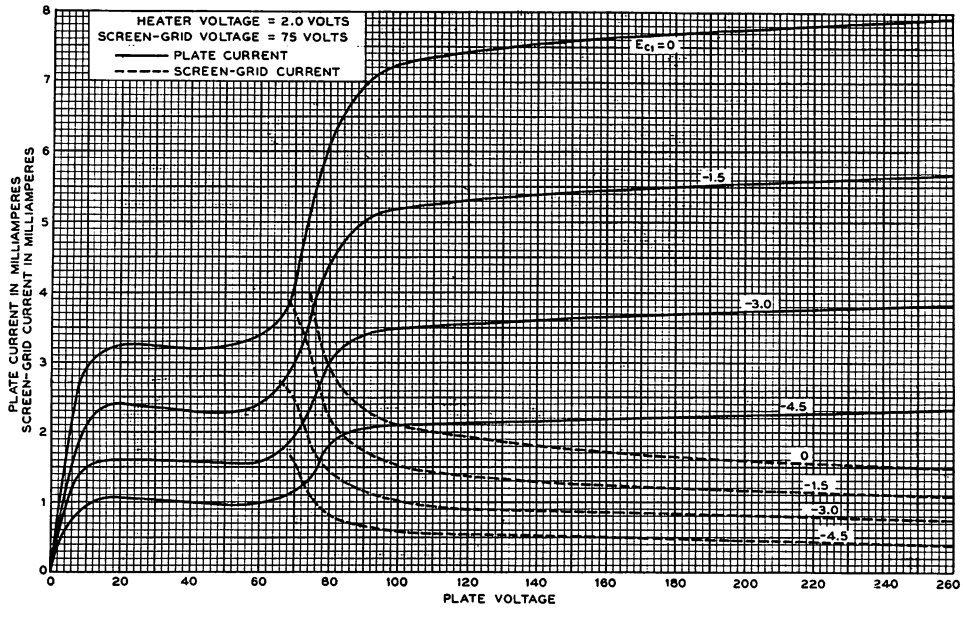

HEATER VOLTAGE = 2.0 VOLTS
SCREEN-GRID VOLTAGE = 75 VOLTS
PLATE CURRENT
SCREEN-GRID CURRENT
$E_{c1}=0$
-1.5
-3.0
-4.5
0
-1.5
-3.0
-4.5
PLATE CURRENT IN MILLIAMPERES
SCREEN-GRID CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0 20 40 60 80 100 120 140 160 180 200 220 240 260
0 1 2 3 4 5 6 7 8

FIG. 3

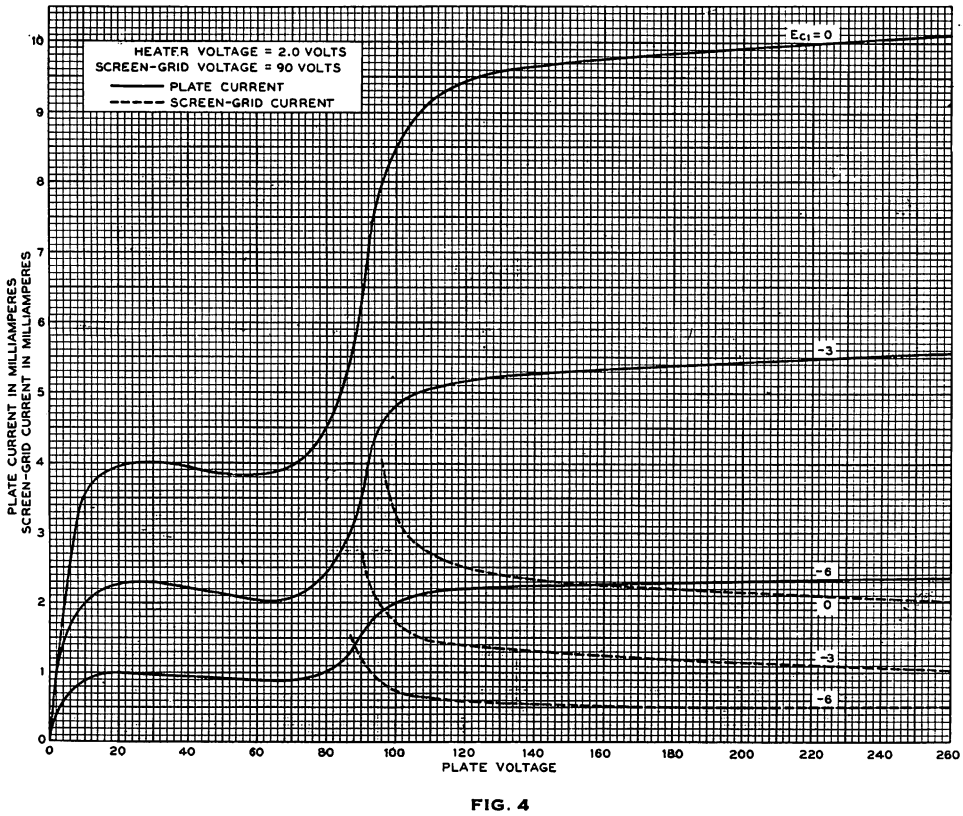

HEATER VOLTAGE = 2.0 VOLTS
SCREEN-GRID VOLTAGE = 90 VOLTS
PLATE CURRENT
SCREEN-GRID CURRENT
$E_{c1}=0$
-3
-6
0
-3
-6
PLATE CURRENT IN MILLIAMPERES
SCREEN-GRID CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0 20 40 60 80 100 120 140 160 180 200 220 240 260
0 1 2 3 4 5 6 7 8 9 10

FIG. 4

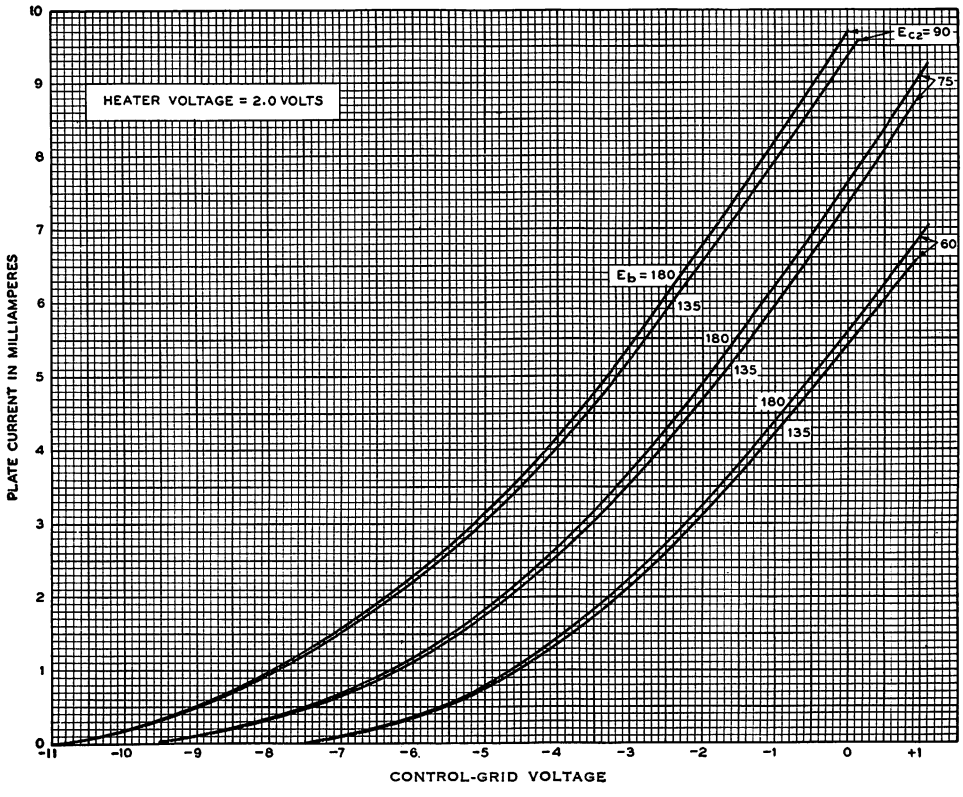

HEATER VOLTAGE = 2.0 VOLTS
PLATE CURRENT IN MILLIAMPERES
CONTROL-GRID VOLTAGE
E_{c2}=90
75
60
E_b=180
135
180
135
180
135
0
1
2
3
4
5
6
7
8
9
10
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
+1

FIG. 5

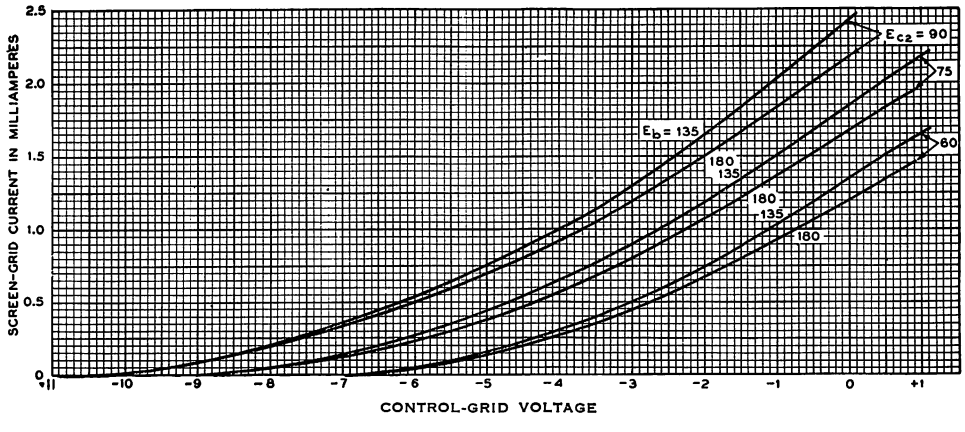

SCREEN-GRID CURRENT IN MILLIAMPERES
CONTROL-GRID VOLTAGE
E_{c2} = 90
75
60
E_b= 135
180
135
180
135
180
0
0.5
1.0
1.5
2.0
2.5
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
+1

FIG. 6

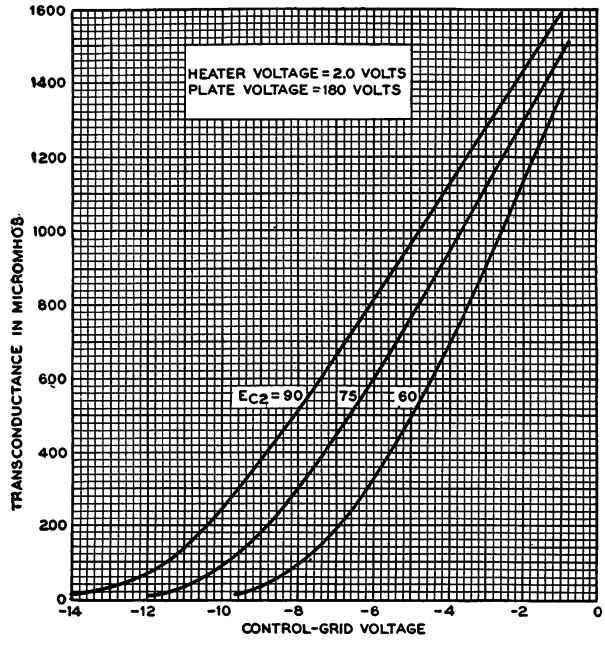


FIG. 7

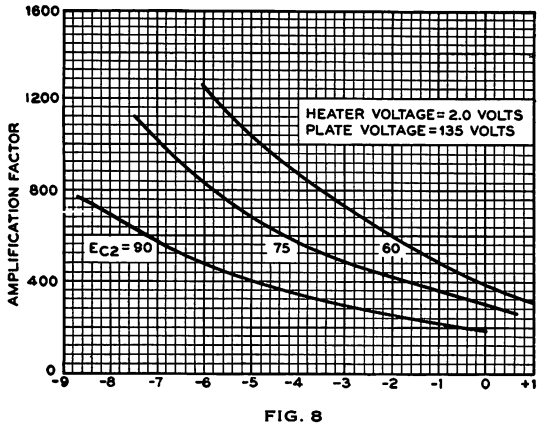


FIG. 8

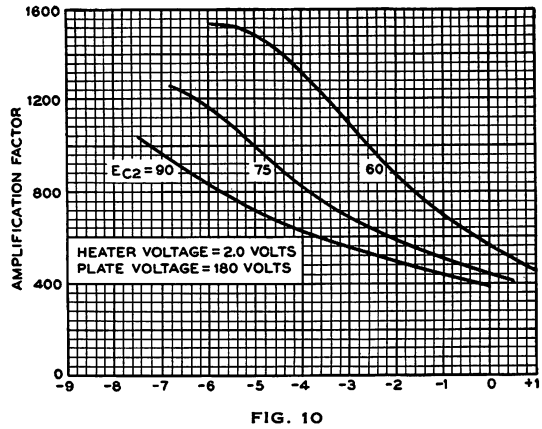


FIG. 10

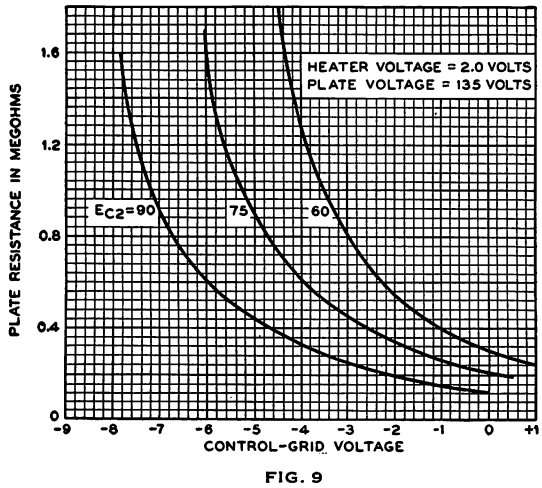


FIG. 9

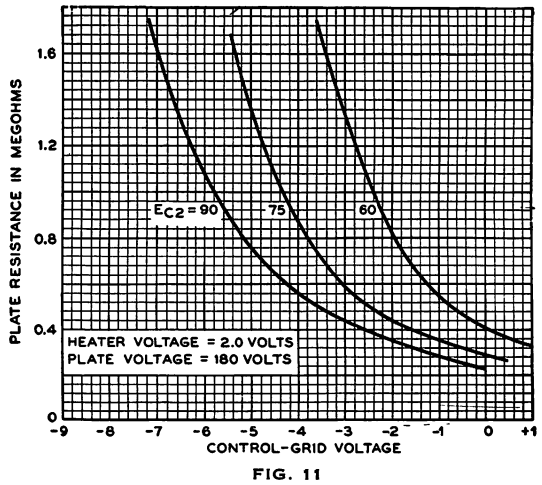


FIG. 11