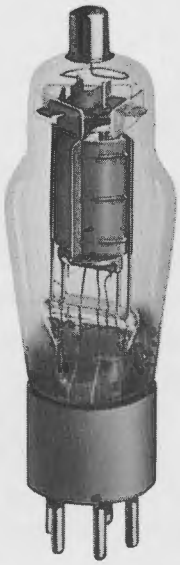
Western Electric

311A and 329A Vacuum Tubes



Classification—Low-power, suppressor-grid pentodes with indirectly heated cathodes

The 311A and 329A tubes are identical except for the heaters.

These tubes are intended primarily for use as audio, carrier or radio-frequency power amplifiers where power outputs of approximately two watts are required and where the plate voltage is not in excess of 180 volts. The suppressor grid is permanently connected to the cathode within the tube.

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

Base and Mounting—These vacuum tubes employ small five-pin thrust type bases with silver plated pins. They are adapted for use in standard five-contact type sockets, preferably those provided with silver-plated contacts such as the Western Electric 141A socket. A small metal cap control-grid terminal is located at the top of the bulb.

The tubes may be mounted in any position.

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Average Direct Interelectrode Capacitances

	A	B	
Control grid to plate	0.29	0.07	μμf.
Control grid to heater, cathode and screen grid	8	9	μμf.
Plate to heater, cathode and screen grid	9	12	μμf.

Column A—Without shield.

Column B—With close fitting metal shield connected to the cathode.

Heater Ratings

	311A Tube	329A Tube	
Heater voltage	10.0	7.5	volts, a.c. or d.c.
Nominal heater current	0.64	0.85	ampere

The heaters should be operated on a voltage basis and at as near the rated voltage as practicable.

The voltage between the cathode and the heater should not exceed 150 volts.

Characteristics—Figures 3 and 4 respectively, show plate current and screen-grid current as functions of control-grid voltage for several values of screen and plate voltage. In all curves the plate voltage is equal to the screen voltage. Amplification factor, plate resistance and transconductance curves for the conditions corresponding to those of Figures 3 and 4 are given respectively in Figures 5, 6 and 7.

Plate current and screen-grid current are shown as functions of plate voltage in Figures 8 and 9 respectively, for a screen-grid voltage of 135 volts and for several values of control-grid voltage. Corresponding curves for amplification factor, plate resistance and transconductance are given in Figures 10, 11 and 12 respectively.

Curves showing the fundamental power output and the second and third harmonic levels as functions of input voltage for a number of values of load resistance for typical operating conditions are given in Figures 13, 14 and 15 respectively.

Limiting Conditions for Safe Operation

Maximum direct plate voltage	180	volts
Maximum direct screen-grid voltage	150	volts
Maximum cathode current (plate current plus screen-grid current)	60	milliamperes
Maximum direct screen-grid current	12	milliamperes

Operating Conditions and Output — Nominal performance data are given in the table on page 3 for a number of typical operating conditions. Less severe operating conditions should be selected in preference to the maximum conditions wherever possible. The life of the tube at maximum conditions will be shorter than at the less severe conditions.

The performance data include the fundamental power output for the indicated values of load resistance and input voltage, and the maximum second and third harmonic levels for input voltages not exceeding the indicated values. Under certain conditions the maximum second harmonic level occurs at a lower input voltage than that given in the table. The power output is given in watts, and the harmonic levels in decibels below the fundamental.

TABLE

Control-grid voltage = —15 volts

Screen - grid voltage = 135 volts

Plate Voltage	Amplification Factor	Plate Resistance	Transconductance	Plate Current	Load Resistance	Input Voltage	Output Power	Second Harmonic	Third Harmonic
Volts		Ohms	Micromhos	Milliamperes	Ohms	Peak Volts	Watts	db	db
135	122	43,000	2800	30	3000	15	1.9	23	24
					3500	15	2.0	27	21
					4000	15	2.0	29	19
					6000	15	1.9	20	18
180*	146	50,000	2900	31	3000	15	2.5	18	30
					4000	15	2.8	21	24
					7000	15	2.5	23	18

*Maximum plate voltage.

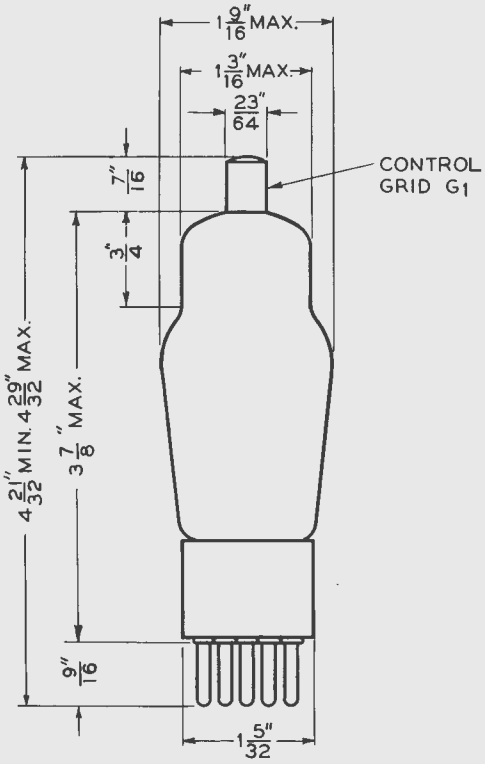

FIG. 1

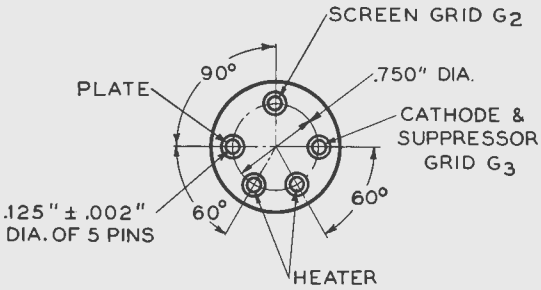

FIG. 2

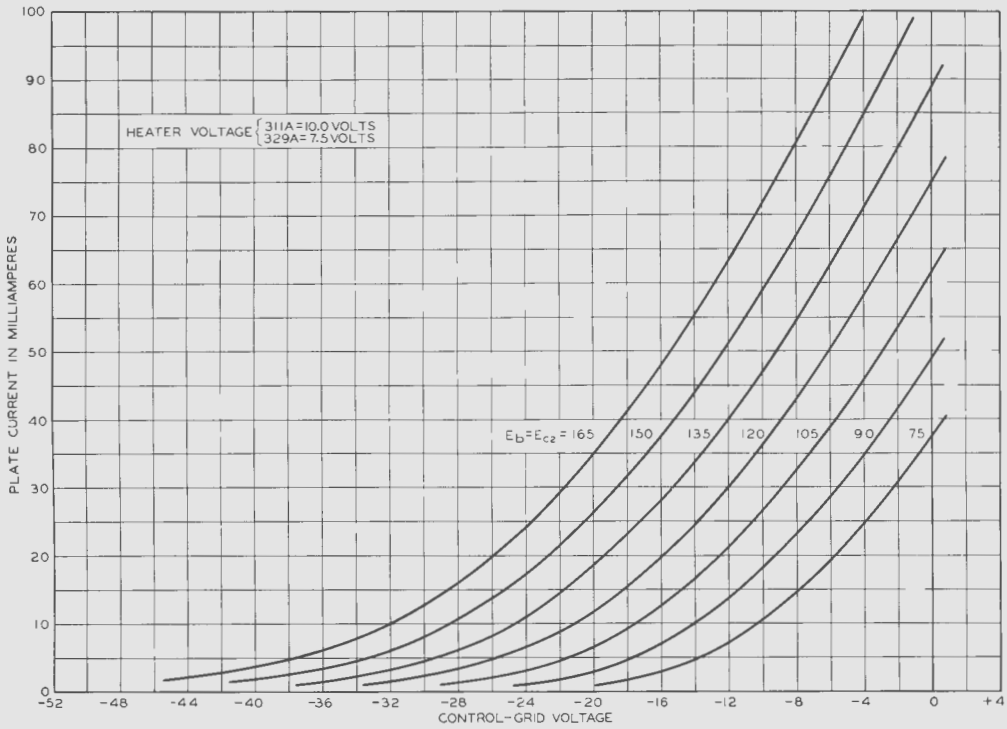
HEATER VOLTAGE { 311A=10.0 VOLTS 329A=7.5 VOLTS
$E_b=E_{c2}$ = 165
150
135
120
105
90
75
PLATE CURRENT IN MILLIAMPERES
CONTROL-GRID VOLTAGE
100
90
80
70
60
50
40
30
20
10
0
-52
-48
-44
-40
-36
-32
-28
-24
-20
-16
-12
-8
-4
0
+4

FIG. 3

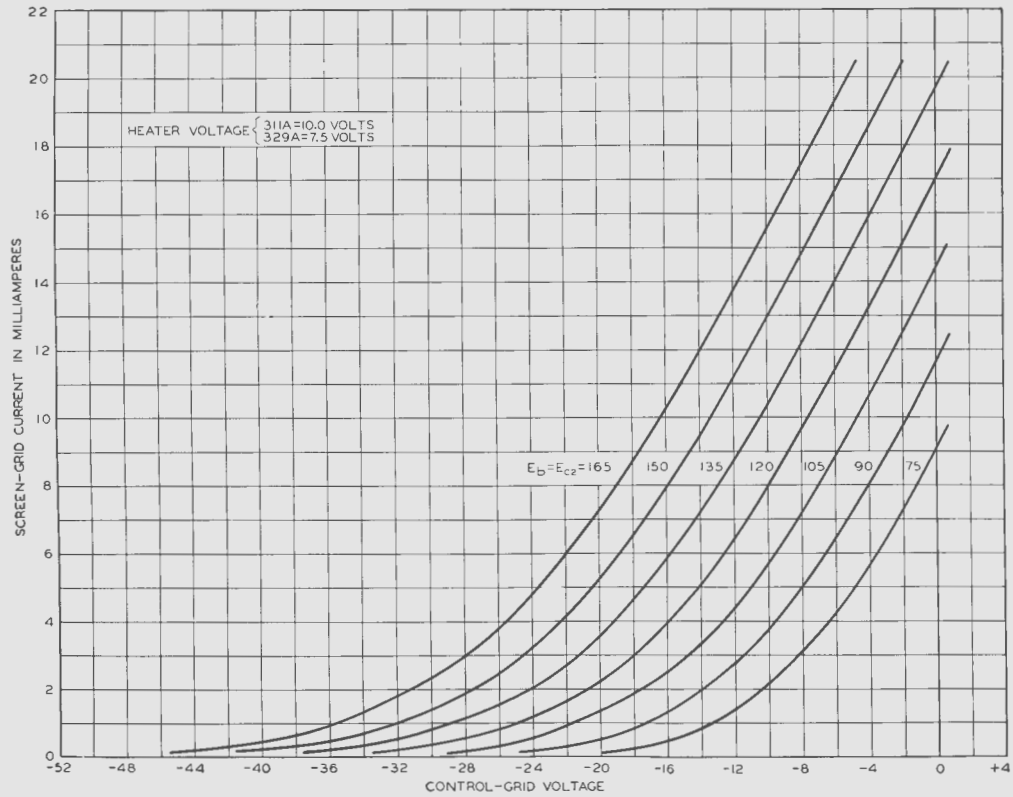
HEATER VOLTAGE { 311A=10.0 VOLTS 329A=7.5 VOLTS
$E_b=E_{c2}$=165
150
135
120
105
90
75
SCREEN-GRID CURRENT IN MILLIAMPERES
CONTROL-GRID VOLTAGE
22
20
18
16
14
12
10
8
6
4
2
0
-52
-48
-44
-40
-36
-32
-28
-24
-20
-16
-12
-8
-4
0
+4

FIG. 4

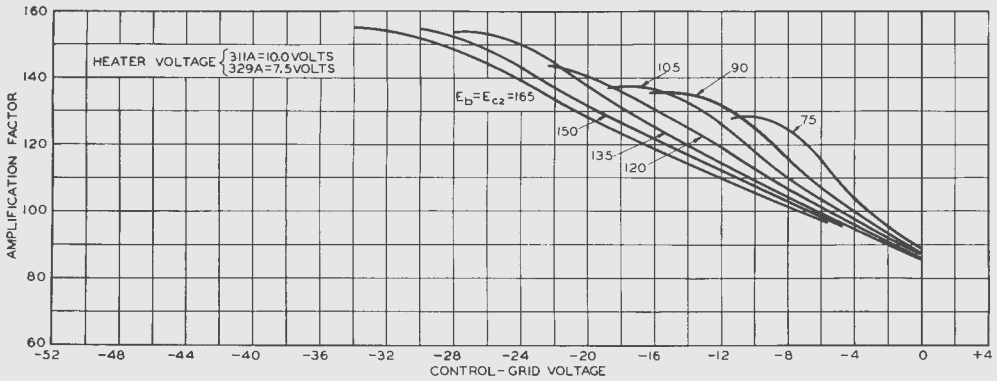

FIG. 5

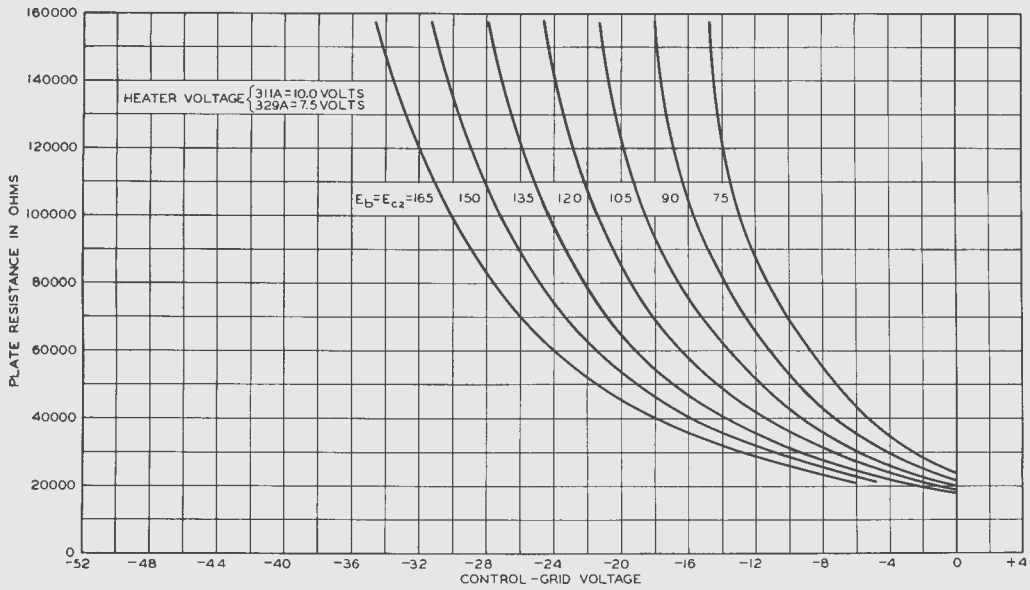

FIG. 6

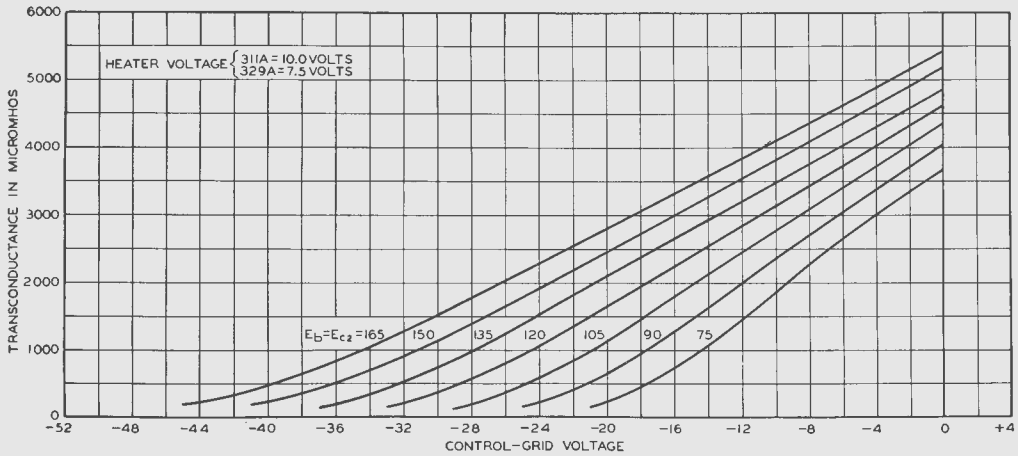

FIG. 7

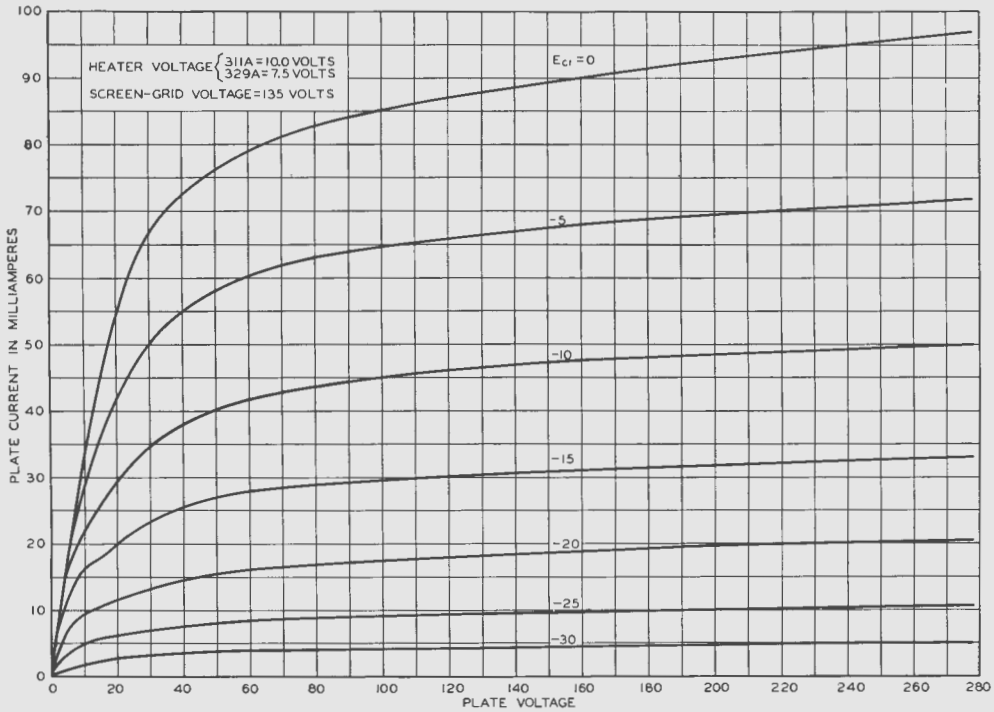
HEATER VOLTAGE { 311A = 10.0 VOLTS
329A = 7.5 VOLTS
SCREEN-GRID VOLTAGE = 135 VOLTS
Ec1 = 0
-5
-10
-15
-20
-25
-30
PLATE CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280

FIG. 8

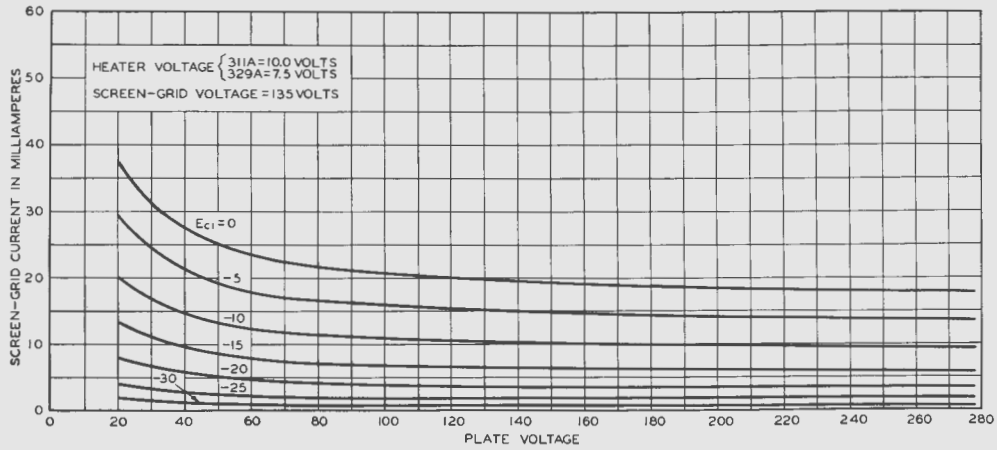
HEATER VOLTAGE { 311A = 10.0 VOLTS
329A = 7.5 VOLTS
SCREEN-GRID VOLTAGE = 135 VOLTS
Ec1 = 0
-5
-10
-15
-20
-25
-30
SCREEN-GRID CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280

FIG. 9

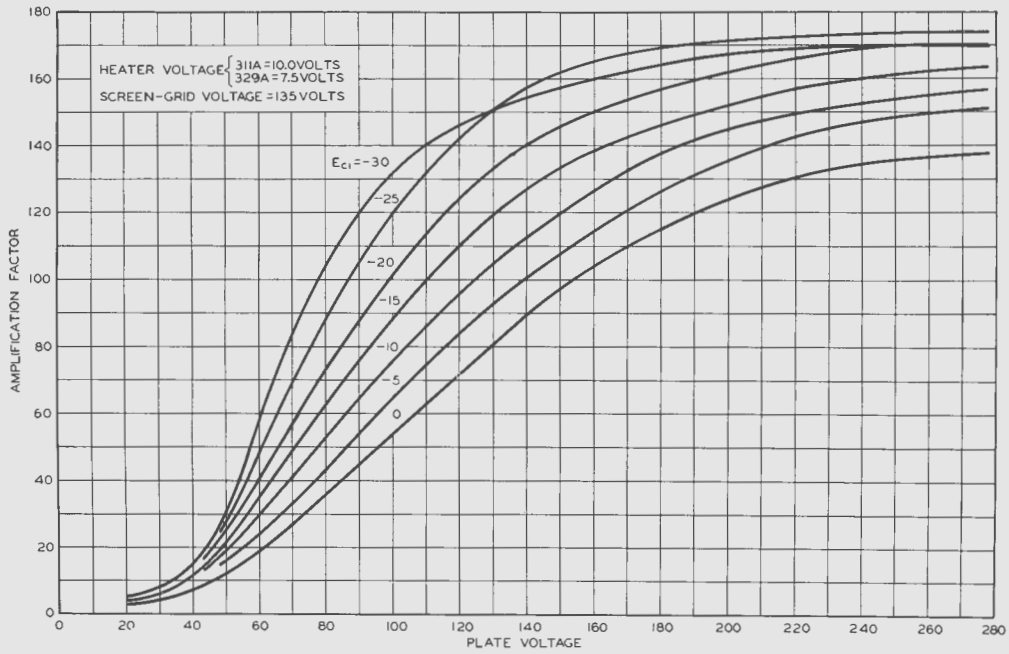

FIG 10

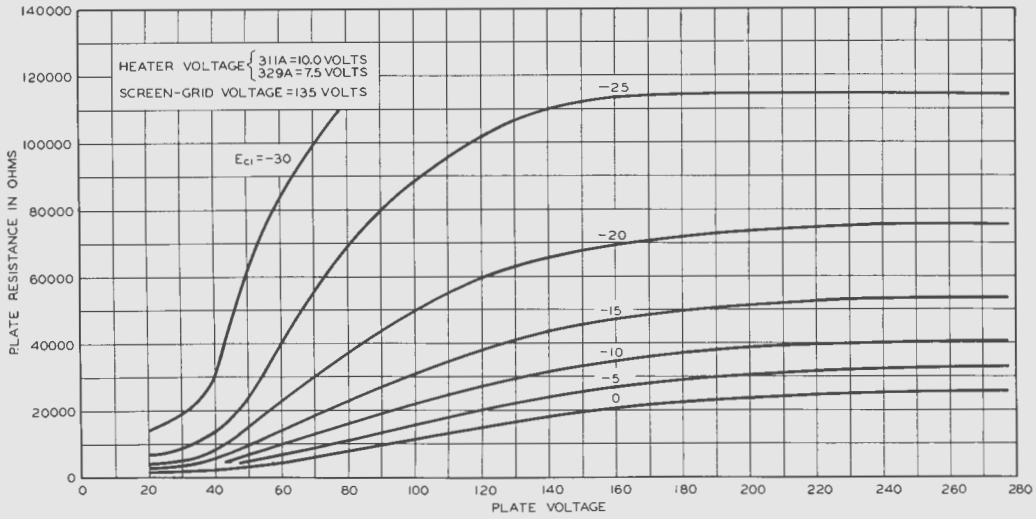

FIG. 11

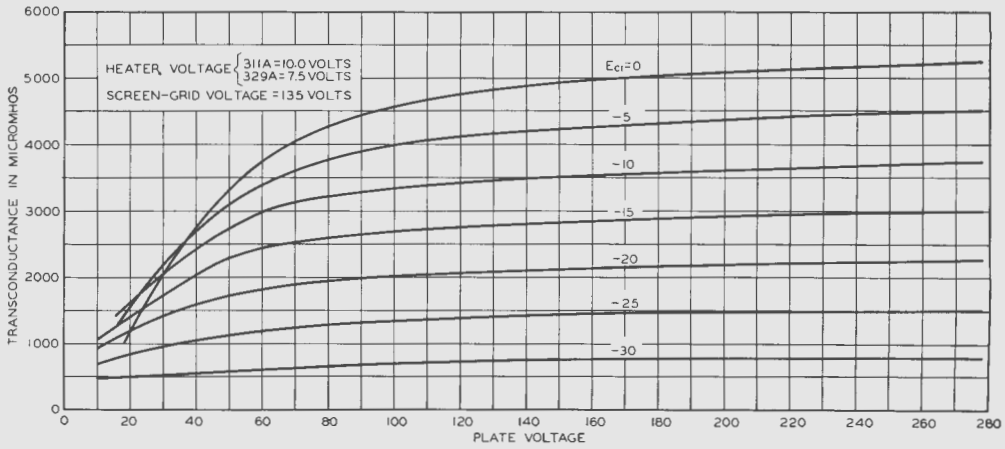

FIG. 12

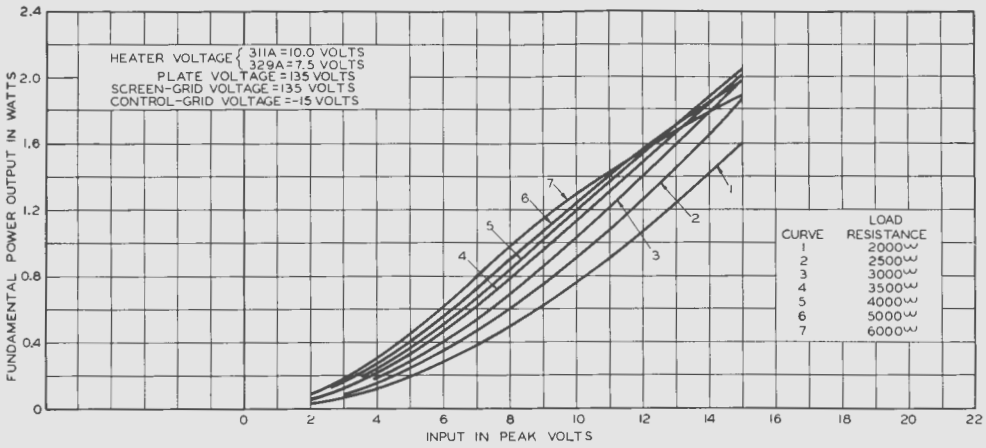

FIG. 13

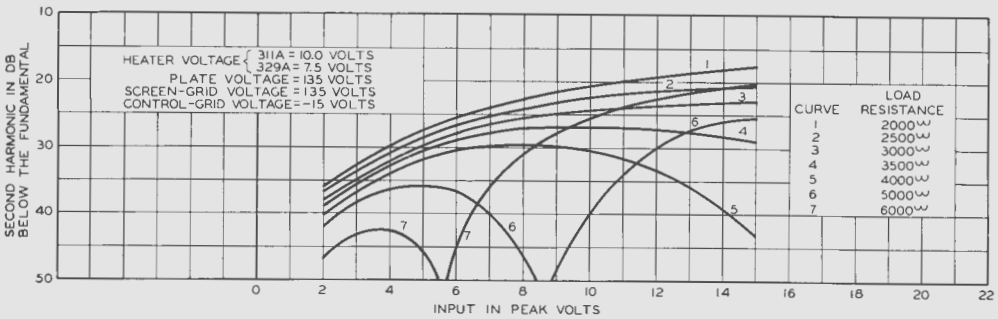

FIG. 14

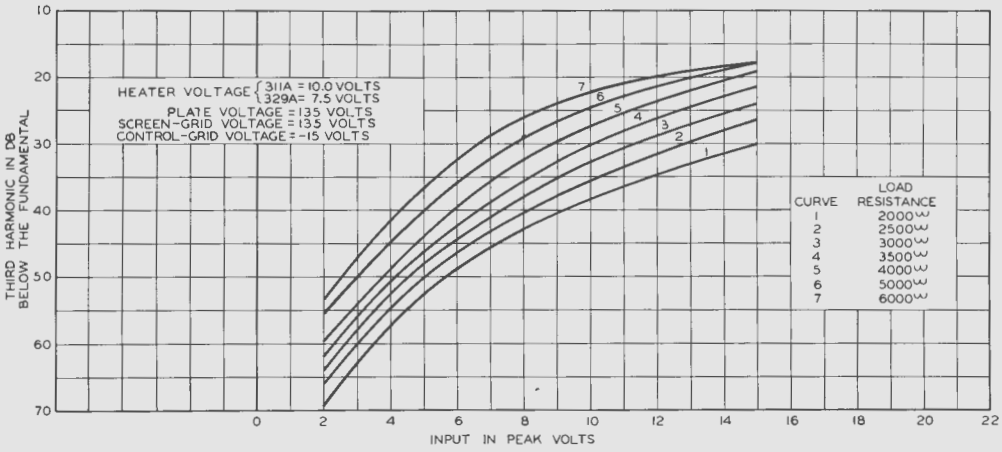

FIG. 15