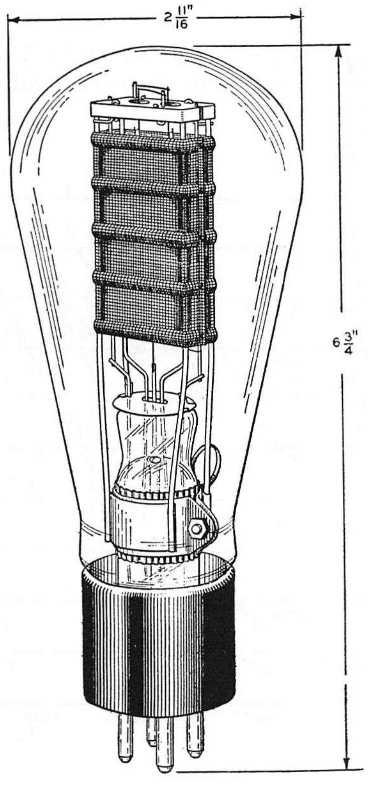
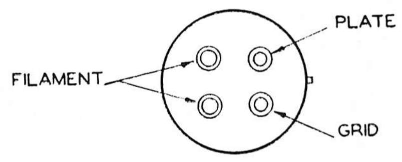
252-A Vacuum Tube





Classification

The No. 252A Vacuum Tube is a three-element tube having a filamentary type of cathode. The tube is for use as an audio-frequency amplifier in output stages where moderate powers are required. It may also be used as an oscillator or modulator.

Base and Socket

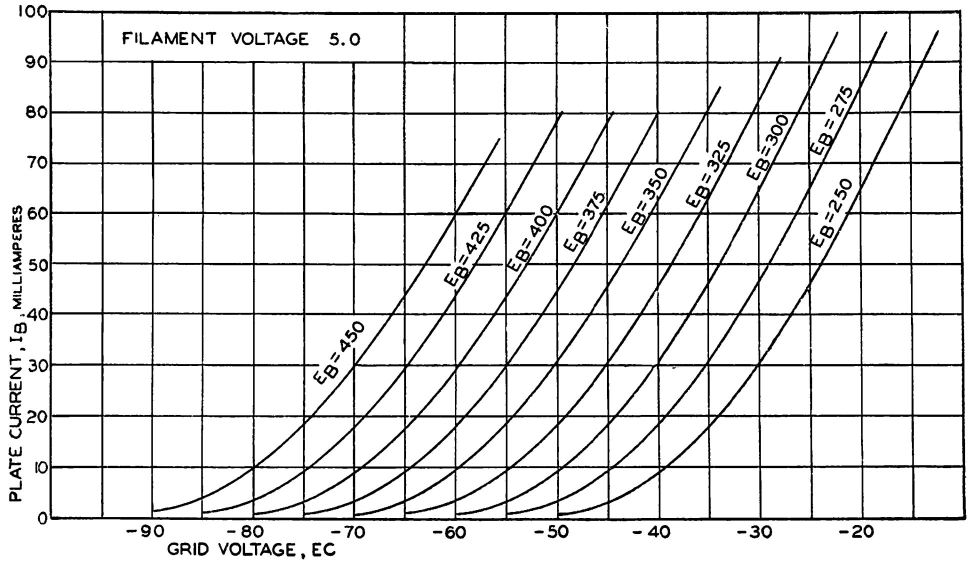
The No. 252A Vacuum Tube employs a standard four-prong, thrust-type base suitable for use in a Western Electric No. 130B (rigid) or No. 131A (cushion) socket or similar type socket. The arrangement of electrode connections to the base terminals is shown above.

Rating and Characteristic Data

Filament Voltage	5 Volts, AC or DC
Average Filament Current	2 Amperes
For Fixed Grid Bias	
Maximum Plate Voltage	450 Volts
Maximum Grid Bias	—65 Volts
Average Plate Current	43 Milliamperes
Average Plate Resistance	1,700 Ohms
Average Amplification Factor	5.0
For Self-Biasing Grid	
Maximum Plate Voltage	450 Volts
Maximum Grid Bias	—60 Volts
Average Plate Current	60 Milliamperes
Average Plate Resistance	1,500 Ohms
Average Amplification Factor	5.1
Approximate Direct Interelectrode Capacities	
Plate to Grid	12.0 MMF
Plate to Filament	4.0 MMF
Grid to Filament	6.5 MMF

Average Static Characteristics

The accompanying curves give the static characteristics of the No. 252A Vacuum Tube. These curves have been obtained with the filament operating on direct current and the grid and plate returns connected to the negative filament terminal.



General Features

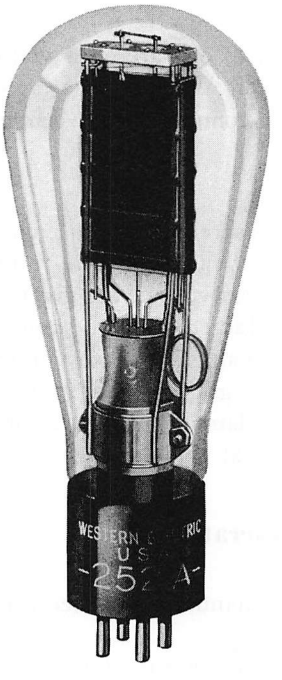
The tube has been designed with an unusually large plate area for its energy dissipation rating. The total electron emission of the filament is very large compared to the maximum space current drain. Both factors insure the delivery of full output power throughout a long life.

An unusually low output of hum, when alternating current is used for filament supply, is obtained through the design characteristics of the filament.

The rugged structure insures against breakage in shipment and in service and makes possible the maintenance of uniform electrical characteristics.

Western Electric

252A Vacuum Tube



Classification—Moderate-power, filamentary triode

Applications—Audio-frequency amplifier where power outputs up to about 8 watts are required.
Oscillator
Modulator

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, four-pin thrust base with bayonet pin.

Socket—Standard, four-contact type such as the Western Electric 143B socket.

Mounting Positions—Either vertical or horizontal. If mounted in a horizontal position, the plane of the filament, as shown in Figure 2, should be vertical.

Average Direct Interelectrode Capacitances

Grid to plate	12.0 $\mu\mu$f.
Grid to filament	6.5 $\mu\mu$f.
Plate to filament	4.0 $\mu\mu$f.

Filament Rating

Filament voltage	5.0 volts, a.c. or d.c.
Nominal filament current	2.0 amperes

The filament of this tube is designed to operate on a voltage basis and should be operated at as near the rated voltage as is practicable. When alternating current is used for heating the filament, the grid and plate returns should be connected to a center tap on the secondary of the filament transformer.

Characteristics—Plate current characteristics of a typical 252A tube are shown in Figure 3 as functions of grid voltage for a number of values of plate voltage. Similar characteristics as functions of plate voltage for several values of grid voltage are given in Figure 4. Amplification factor, plate resistance, and transconductance characteristics are shown in Figures 5, 6 and 7, respectively as functions of grid voltage for several values of plate voltage. All of these characteristics are for direct-current filament supply with the grid and plate returns connected to the negative end of the filament. With alternating-current filament supply, approximately the same characteristics are obtained if 3.0 is added to the numerical value of each grid bias.

Limiting Conditions for Safe Operation

Maximum plate voltage	500 volts
Maximum plate current for manually adjusted grid bias or self-biasing circuit	*90 milliamperes
Maximum plate current of average tube for fixed grid bias	**75 milliamperes
Maximum instantaneous grid potential on positive swing of input voltage	+10 volts

*Modified as indicated in Figure 3 for plate voltages between 425 and 500 volts.
**Except between plate voltages of 425 and 500 volts, where limits should be 15 milliamperes less than those indicated in Figure 3 for a given plate voltage.

Operating Conditions and Output—Permissible combinations of operating plate voltage and plate current are included within the area, ABCDE, in Figure 3. Amplification factor, plate resistance, transconductance, and performance data are listed in the table on page 3 for a number of typical operating conditions represented by selected points within this area. A less severe operating condition should be selected in preference to a maximum operating condition wherever possible. The life of the tube at maximum conditions may be shorter than at less severe conditions.

Where it is necessary to operate a 252A tube at or near a maximum permissible plate current, provision should be made for adjusting the grid bias of each tube independently so that the maximum safe plate current will not be exceeded in any tube. Alternatively, a self-biasing circuit may be used, in which the grid bias for each tube is obtained from the voltage drop produced by the plate current passing through a resistance. Where it is necessary to use a fixed grid bias, the plate current of the average tube should be limited to a value 15 milliamperes below the maximum safe plate current, so that tubes having plate currents higher than the average will not exceed the maximum rating.

The performance data include the fundamental power output and the second and third harmonic levels for the indicated values of load resistance and input voltage. The power output, P_m, is given in watts and the second and third harmonic levels, F_{2m} and F_{3m}, are given in decibels below the fundamental in each case. The peak value of the sinusoidal input voltage, E_{gm}, is numerically equal to the grid bias for each operating condition. For a smaller input voltage, E_g, the output and harmonic levels are given approximately by the following relations:

$$P = P_m \left(\frac{E_g}{E_{gm}}\right)^2$$

$$F_2 = F_{2m} + 20 \log_{10} \frac{E_{gm}}{E_g}$$

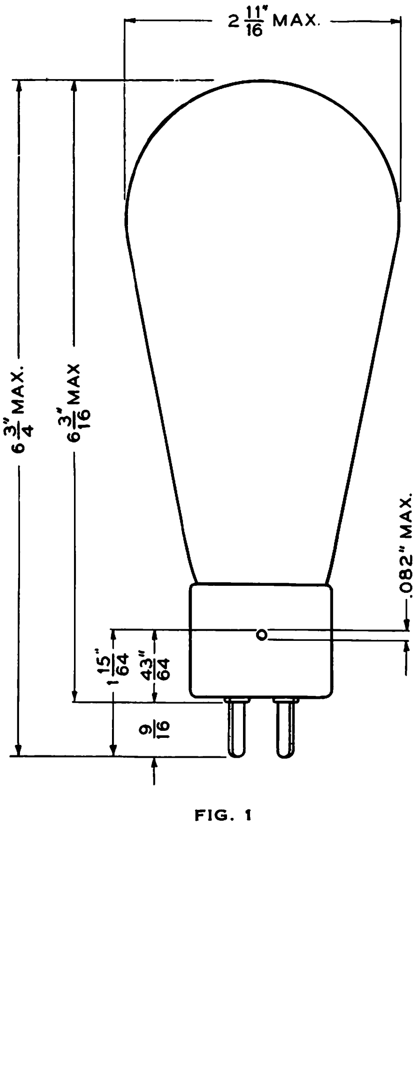
$$F_3 = F_{3m} + 40 \log_{10} \frac{E_{gm}}{E_g}$$

Curves showing the variation of power output and harmonic levels with load resistance for several values of operating plate current are shown in Figures 8, 9 and 10 for a plate voltage of 450 volts.

TABLE

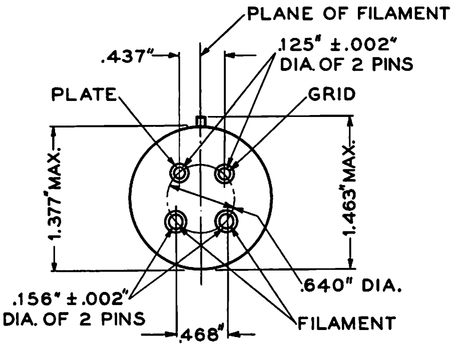
Plate Voltage Volts	Grid Bias Volts	Plate Current Milliamperes	Amplification Factor	Plate Resistance Ohms	Transconductance Micromhos	Input Voltage Peak Volts	Load Resistance Ohms	Output Power Watts	Second Harmonic db	Third Harmonic db
300	−45	19	5.08	2300	2250	45	8000	2.0	26	36
300	−40	31	5.14	1850	2800	40	4000	2.5	25	37
							5000	2.2	28	41
300	−35	46	5.20	1600	3300	35	2500	2.4	26	41
350	−50	30	5.10	1850	2700	50	6000	3.1	27	39
350	−45	45	5.16	1600	3200	45	3500	3.6	27	40
400	−60	29	5.08	1900	2650	60	8000	3.7	28	40
400	−55	44	5.12	1650	3100	55	2500	5.4	21	39
							4000	5.0	26	38
							5000	4.5	28	42
400	−50	60	5.18	1500	3500	50	2500	5.2	26	38
							3000	5.0	28	41
400	−45	78	5.20	1350	3850	45	1500	4.9	25	38
450	−70	30	5.06	1950	2600	70	8000	5.2	26	37
450	−65	44	5.10	1650	3050	65	5000	6.2	26	38
450	−60	60	5.14	1500	3450	60	3000	6.9	25	37
475	−70	43	5.10	1700	3050	70	6000	6.5	27	39
475	−65	59	5.14	1500	3450	65	4000	7.3	27	40
*450	−55	78	5.18	1350	3800	55	2500	6.8	27	41
*500	−75	43	5.08	1700	3050	75	6000	7.4	25	38
*500	−70	58	5.12	1500	3450	70	4000	8.3	26	38

*Maximum operating conditions.



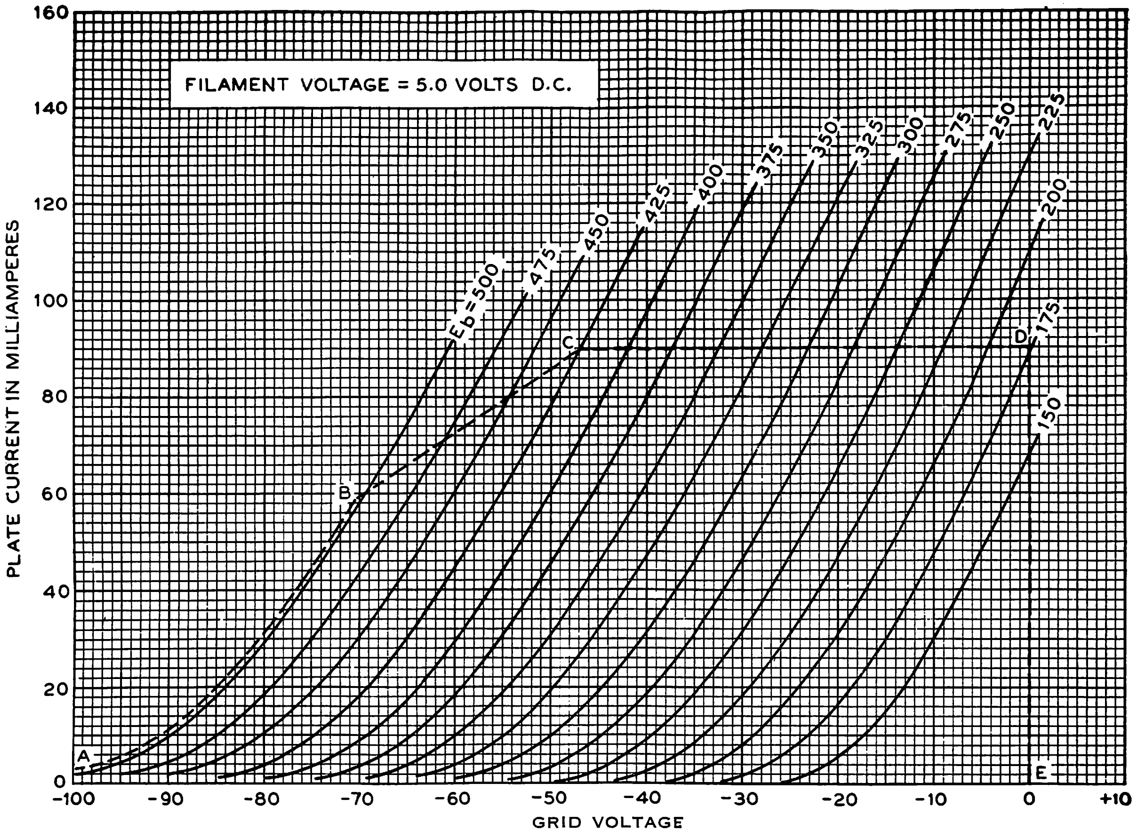
$2\frac{11}{16}$" MAX.
$6\frac{3}{4}$" MAX.
$6\frac{3}{16}$" MAX
.082" MAX.
$1\frac{15}{64}$"
$\frac{43}{64}$"
$\frac{9}{16}$

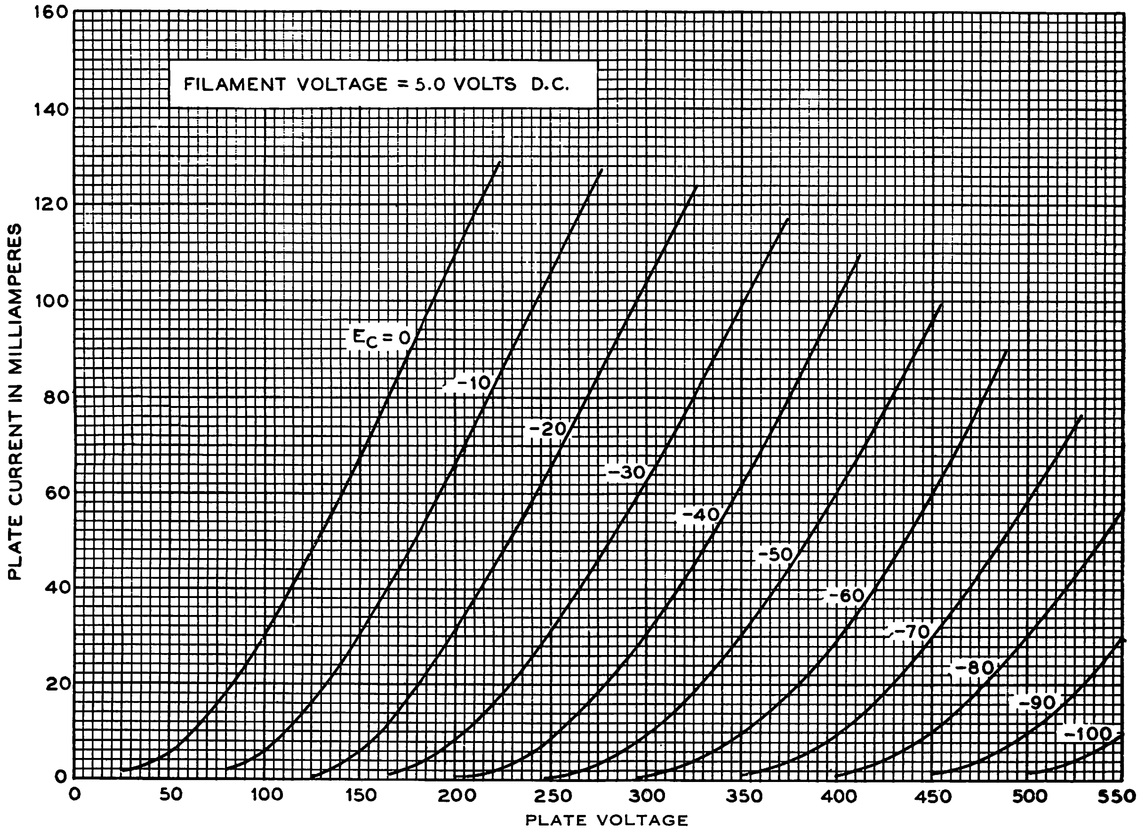
FIG. 1



PLANE OF FILAMENT
.437"
.125" ±.002"
DIA. OF 2 PINS
PLATE
GRID
1.377" MAX.
1.463" MAX.
.640" DIA.
.156" ±.002"
DIA. OF 2 PINS
.468"
FILAMENT

FIG. 2


FILAMENT VOLTAGE = 5.0 VOLTS D.C.
PLATE CURRENT IN MILLIAMPERES
GRID VOLTAGE
Eb=500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
A
B
C
D
E
FIG. 3


FILAMENT VOLTAGE = 5.0 VOLTS D.C.
PLATE CURRENT IN MILLIAMPERES
PLATE VOLTAGE
EC = 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
FIG. 4

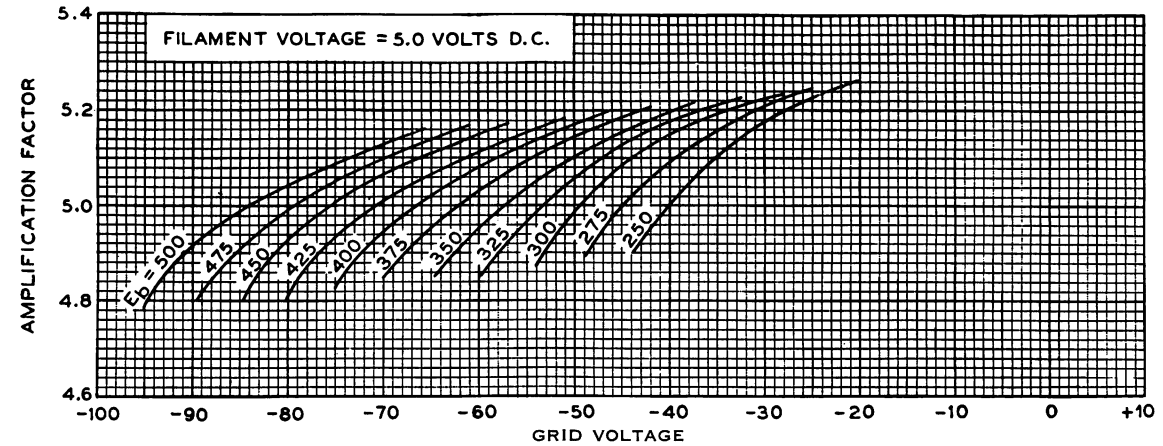


FIG. 5

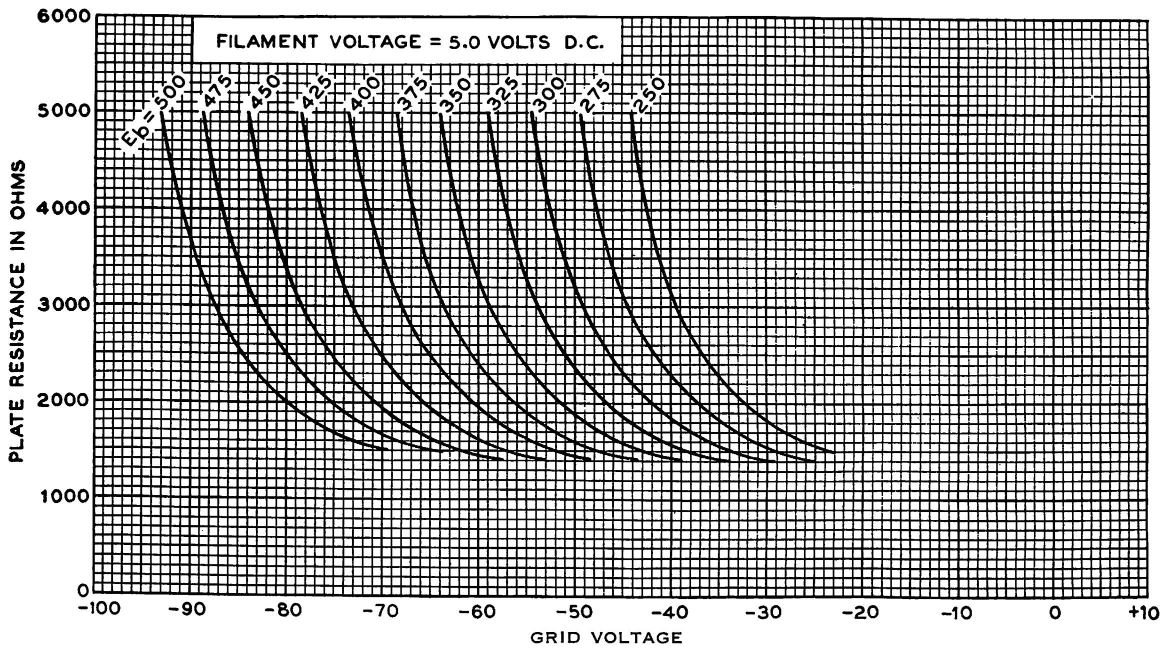


FIG. 6

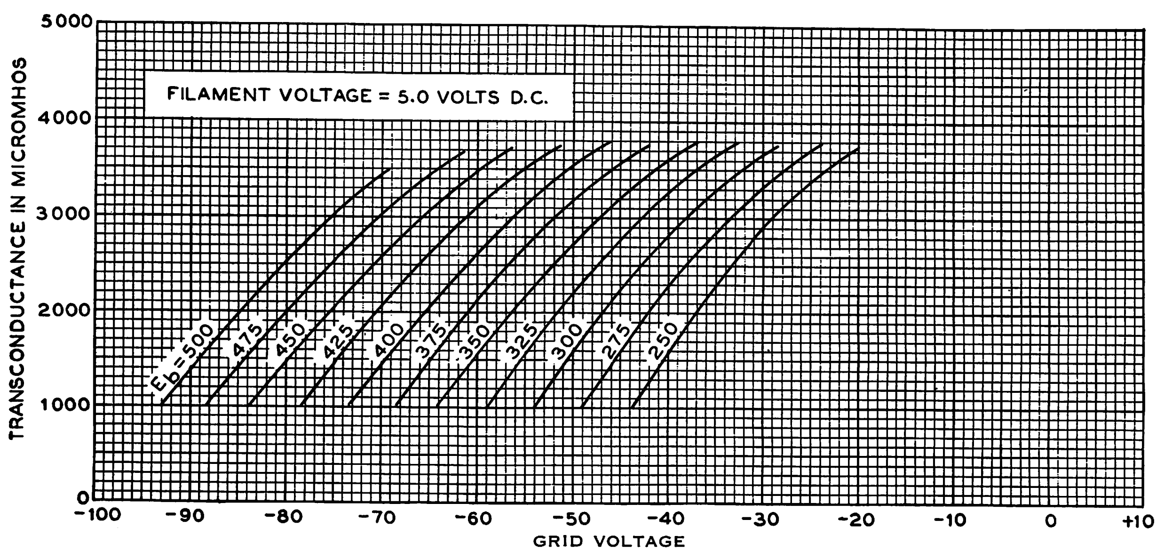
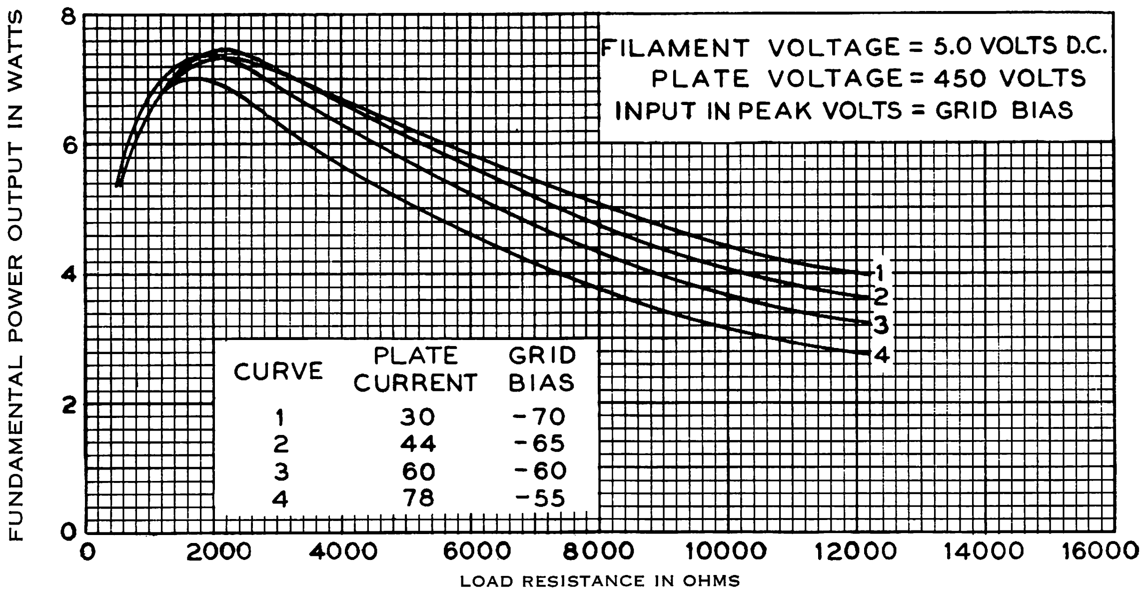


FIG. 7



CURVE	PLATE CURRENT	GRID BIAS
1	30	-70
2	44	-65
3	60	-60
4	78	-55

FIG. 8

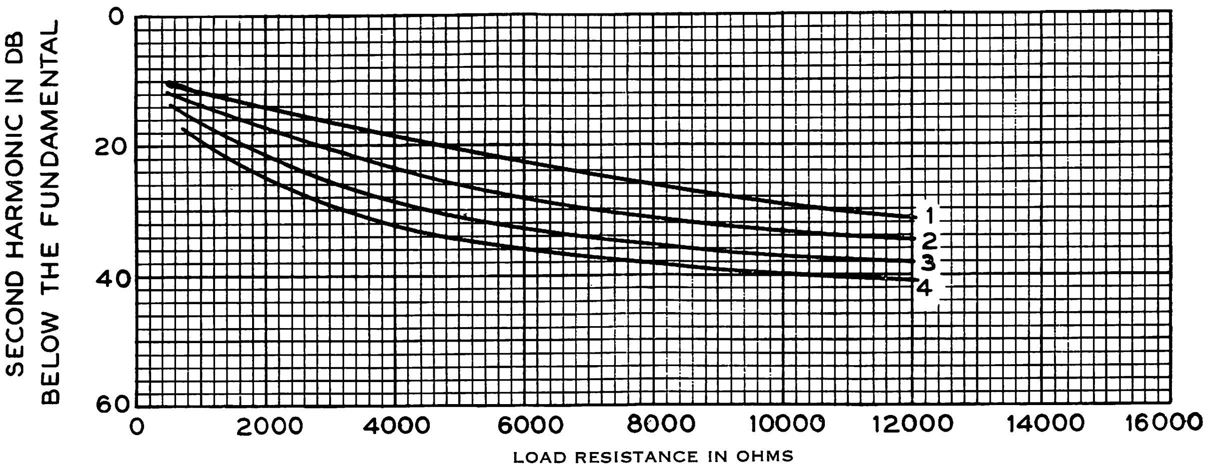


FIG. 9

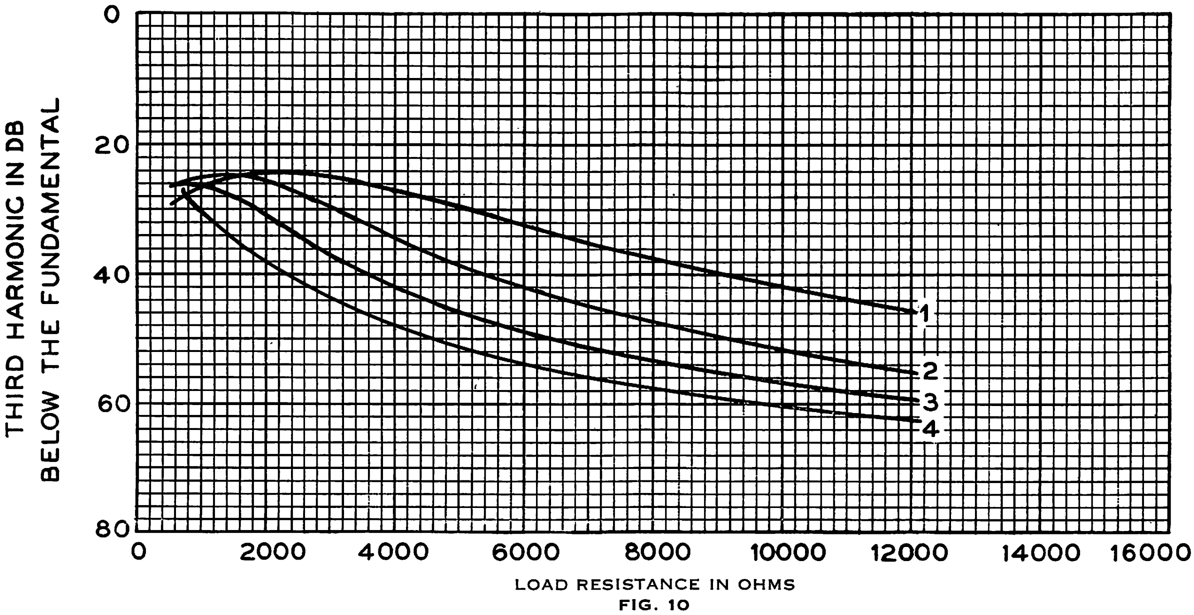


FIG. 10