

PENTODE for use in telephone equipment with a life longer than 10 000 hours

MECHANICAL DATA

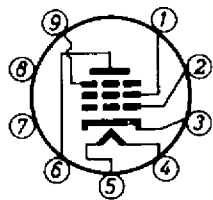
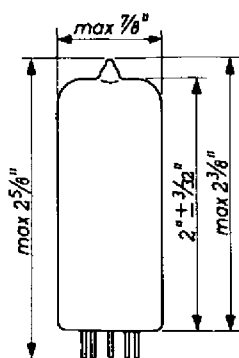
|                          |                     |
|--------------------------|---------------------|
| Cathode                  | Coated unipotential |
| Base                     | E9-1                |
| Bulb                     | T6½                 |
| Mounting position        | Any                 |
| RETMA basing designation | 9BK                 |

TUBE OUTLINE

BOTTOM VIEW  
OF BASE

BASE PIN  
No.

ELEMENT



|   |                               |
|---|-------------------------------|
| 1 | Grid No.2                     |
| 2 | Grid No.1                     |
| 3 | Cathode                       |
| 4 | Heater                        |
| 5 | Heater                        |
| 6 | Plate                         |
| 7 | Internally connected          |
| 8 | Internally connected          |
| 9 | Grid No.3;<br>internal shield |

ELECTRICAL DATA

HEATER DATA

|                                           |       |       |       |       |
|-------------------------------------------|-------|-------|-------|-------|
| Heater voltage <sup>1)</sup>              | min.  | bogey | max.  |       |
|                                           |       | 6.3   |       | volts |
| Heater current at 6.3 volts <sup>2)</sup> | 0.285 | 0.300 | 0.315 | amp   |

<sup>1)</sup> In order to obtain a tube life of 10 000 hours in case of parallel supply of the heaters, the maximum variations of the heater voltage should be less than  $\pm 5\%$  (absolute limits)

<sup>2)</sup> In order to obtain a tube life of 10 000 hours in case of series supply of the heaters, the maximum variation of the heater current due to voltage fluctuations and tolerances in the parts should be less than  $\pm 1.5\%$  (absolute limits)

DIRECT INTERELECTRODE CAPACITANCES

|                                                                       | bogey | max.                |
|-----------------------------------------------------------------------|-------|---------------------|
| Plate to all other elements                                           | 3.6   | 4.2 $\mu\text{F}$   |
| Grid No.1 to all other elements                                       | 8.5   | 9.2 $\mu\text{F}$   |
| Plate to grid No.1                                                    |       | 0.015 $\mu\text{F}$ |
| Grid No.1 to heater                                                   |       | 0.15 $\mu\text{F}$  |
| Cathode to heater                                                     | 4.0   | $\mu\text{F}$       |
| Grid No.1 to all other elements at<br>a cathode current of 12.1 mamps | 11.3  | $\mu\text{F}$       |
| Radiation capacitance of plate <sup>3)</sup>                          |       | 0.025 $\mu\text{F}$ |
| Radiation capacitance of grid No.1 <sup>3)</sup>                      |       | 0.025 $\mu\text{F}$ |

RATINGS (design center values)

|                                                                 |             |
|-----------------------------------------------------------------|-------------|
| Plate voltage                                                   | 210 volts   |
| Plate voltage (without current)                                 | 550 volts   |
| Plate dissipation                                               | 2.1 watts   |
| Grid No.2 voltage                                               | 210 volts   |
| Grid No.2 voltage (without current)                             | 550 volts   |
| Grid No.2 dissipation                                           | 0.35 watt   |
| Cathode current                                                 | 16 mamps    |
| Grid No.1 circuit resistance<br>(with automatic bias)           | 1 megohm    |
| Voltage between heater and cathode                              | 100 volts   |
| External resistance between<br>cathode and heater <sup>4)</sup> | 20 000 ohms |
| Bulb temperature                                                | 170 °C      |

<sup>3)</sup> Radiation capacitance is the capacitance of the concerning electrode to a surrounding box with an inner diameter of 2 1/16" and a length of 3 7/8", the other electrodes being earthed

<sup>4)</sup> For stable operation it is advisable to restrict the external resistance between heater and cathode to values smaller than 20 000 ohms

| <u>TYPICAL CHARACTERISTICS</u>                                                       |      |       |                 |
|--------------------------------------------------------------------------------------|------|-------|-----------------|
|                                                                                      | min. | bogey | max.            |
| Plate voltage                                                                        |      | 210   | volts           |
| Grid No.3 voltage                                                                    |      | 0     | volt            |
| Grid No.2 voltage                                                                    |      | 120   | volts           |
| Cathode resistor                                                                     |      | 165   | ohms            |
| Plate current <sup>5)</sup>                                                          | 8.7  | 10    | 11.3 mamps      |
| Grid No.2 current <sup>5)</sup>                                                      | 1.7  | 2.1   | 2.5 mamps       |
| Transconductance <sup>5)</sup>                                                       | 7800 | 9000  | 10200 micromhos |
| Amplification factor of grid No.2 with respect to grid No.1                          |      | 34    |                 |
| Plate resistance                                                                     | 0.3  | 0.5   | megohm          |
| Equivalent noise resistance (R.F.)                                                   |      | 750   | 1000 ohms       |
| Equivalent noise resistance (30-10 000 c/s)                                          |      |       | 36000 ohms      |
| Negative grid No.1 bias at plate current of 0.5 mamp                                 | 3.0  |       | 5.25 volts      |
| Grid current starting point                                                          |      |       |                 |
| Grid No.1 bias at grid No.1 current = +0.3 $\mu$ A                                   |      |       | -1.1 volts      |
| Negative grid current (grid <sup>5)</sup> series resistor 0.1 megohm)                |      |       | 0.5 $\mu$ amp   |
| Grid No.1 hum voltage (grid <sup>6)</sup> leak = 0.5 megohm)                         |      | 0.06  | 0.5 mvolt       |
| Insulation between two electrodes                                                    | 20   |       | megohms         |
| Insulation between cathode and heater (voltage between heater and cathode 100 volts) | 5    |       | megohms         |
| Heating time of the cathode (till half the ultimate plate current)                   | 8    | 13    | 20 sec          |
| Cooling time of the cathode (till half the original plate current)                   | 7    | 12    | sec             |

<sup>5)</sup>See page 4

<sup>6)</sup>This value has been measured at a mains frequency of 50 c/s with the electric center of the heater connected to earth. The voltage has been measured in the anode lead with the aid of a band-pass filter linear from 30-200 c/s and translated into a hum voltage on the grid.

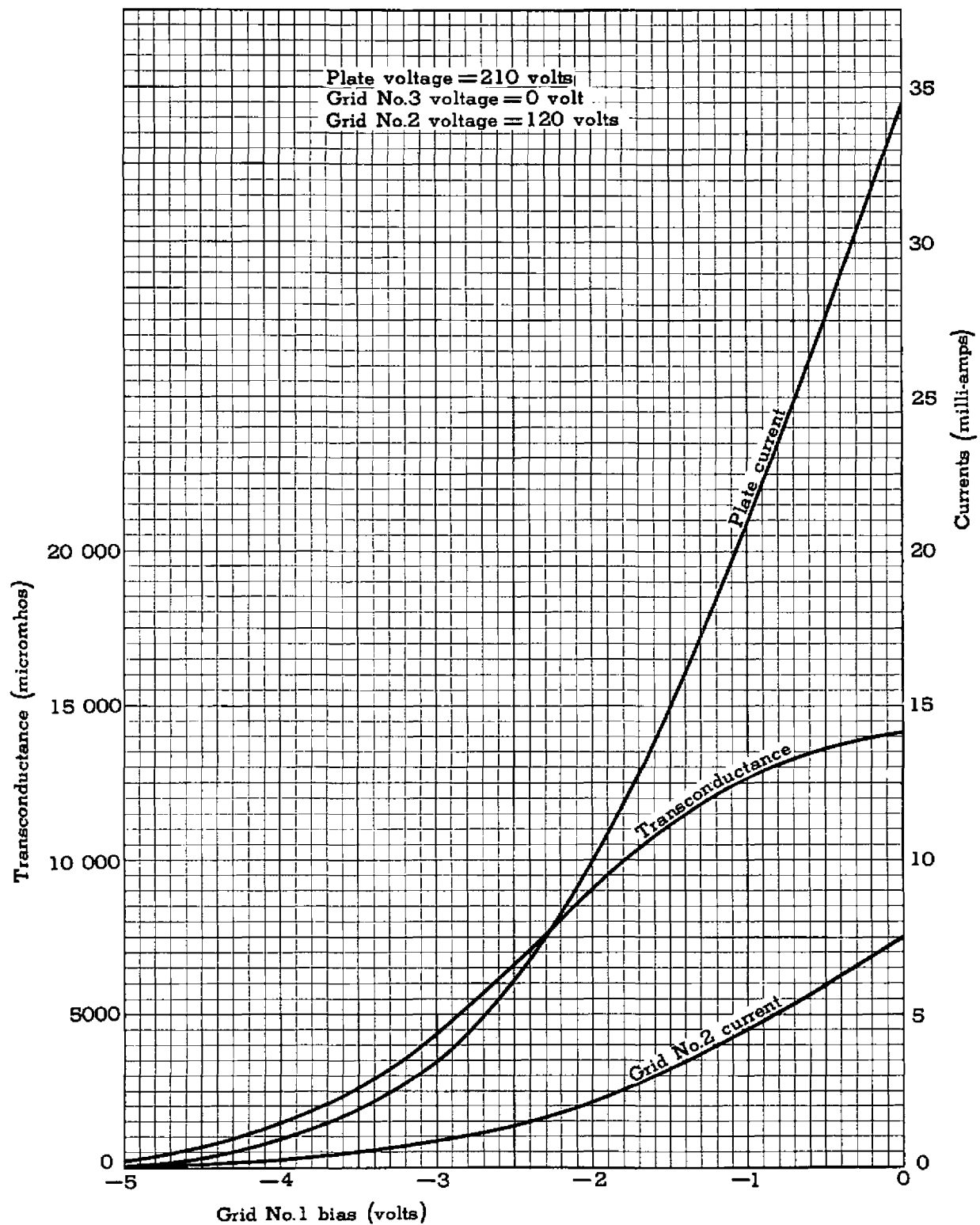
OPERATING CHARACTERISTICS for use as class A amplifier  
(Measured with a resistor of 0.33 megohm in series with  
grid No.1 as internal resistance of the driver tube.)

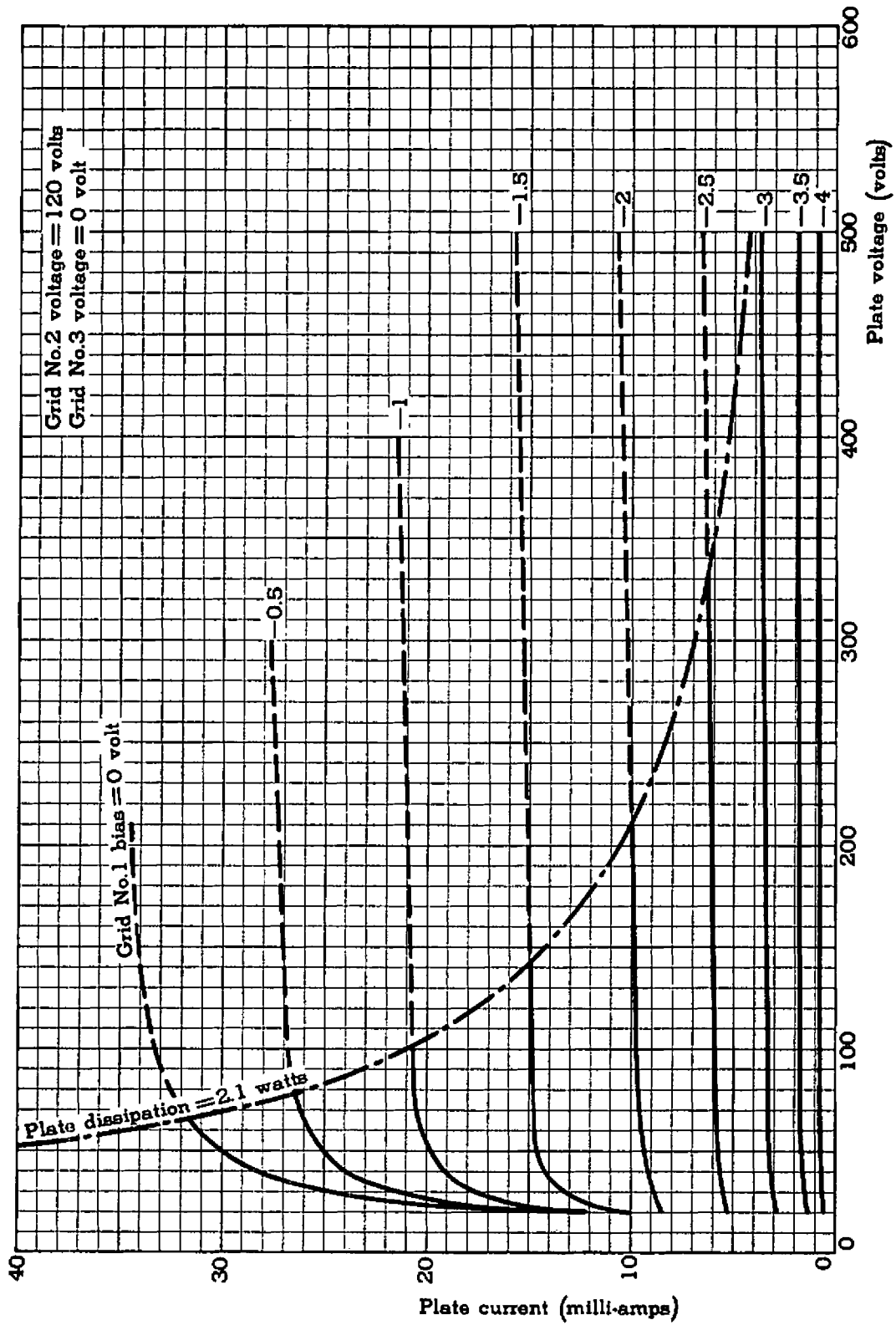
|                                                       |        |                 |
|-------------------------------------------------------|--------|-----------------|
| Plate voltage                                         | 120    | 210 volts       |
| Grid No.3 voltage                                     | 0      | 0 volt          |
| Grid No.2 supply voltage                              | 120    | 120 volts       |
| Grid No.2 series resistor                             | 5600   | 5600 ohms       |
| Cathode resistor                                      | 180    | 180 ohms        |
| Plate current                                         | 8.3    | 8.3 mamps       |
| Grid No.2 current                                     | 1.7    | 1.7 mamps       |
| Transconductance                                      | 8200   | 8200 micromhos  |
| Plate resistance                                      | 0.42   | 0.44 megohm     |
| Load A.C. resistance                                  | 10 000 | 20 000 ohms     |
| Output power at a<br>distortion of 10 percent         | 340    | 660 mwatts      |
| Input A.C. voltage at<br>a distortion of 10 percent   | 1.1    | 1.1 volts(rms)  |
| Output power at grid No.1<br>current = +0.3 $\mu$ amp | 400    | 870 mwatts      |
| Input A.C. voltage at an<br>output power of 50 mwatts | 0.35   | 0.25 volt (rms) |

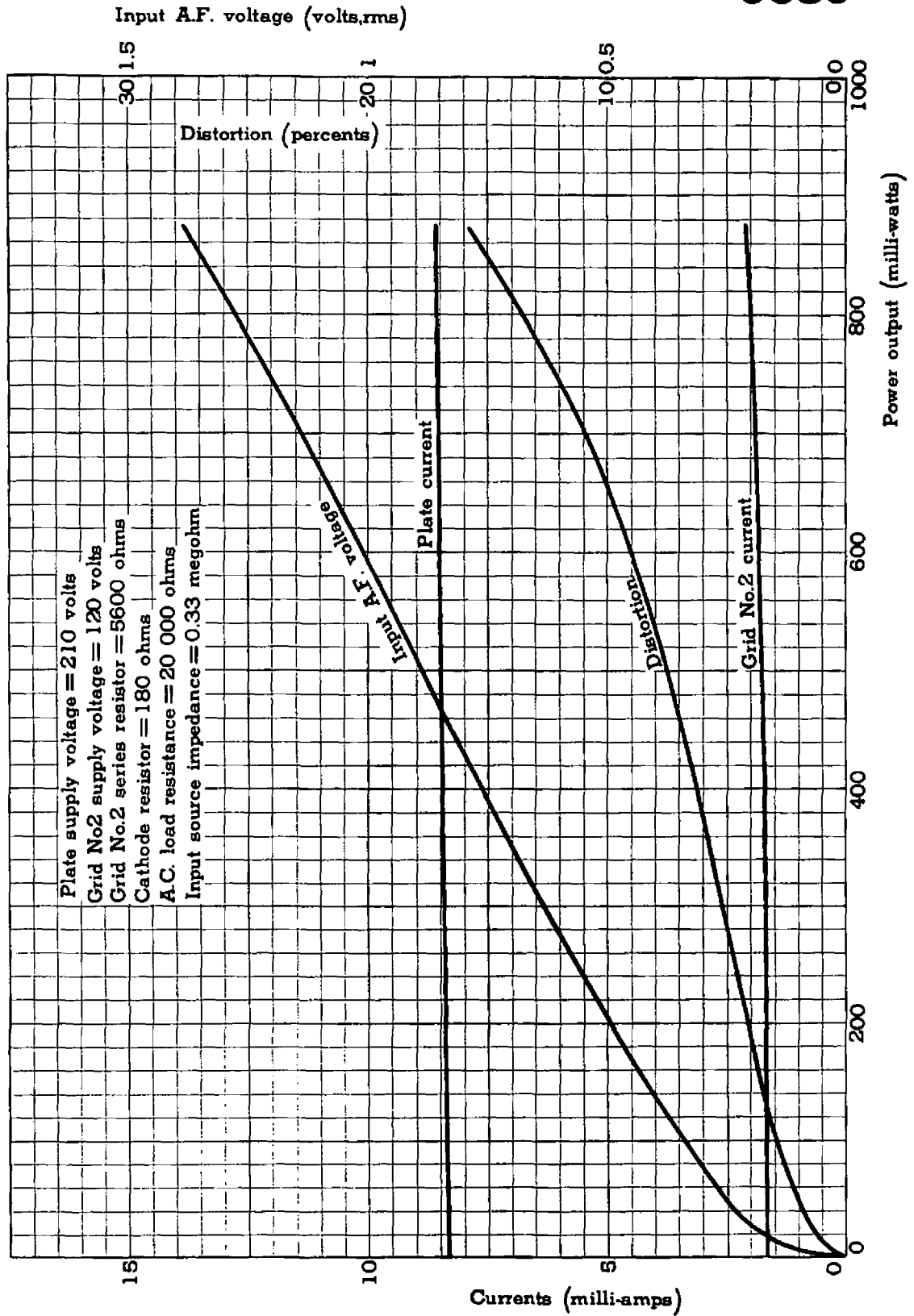
#### <sup>5</sup>) END POINT OF LIFE

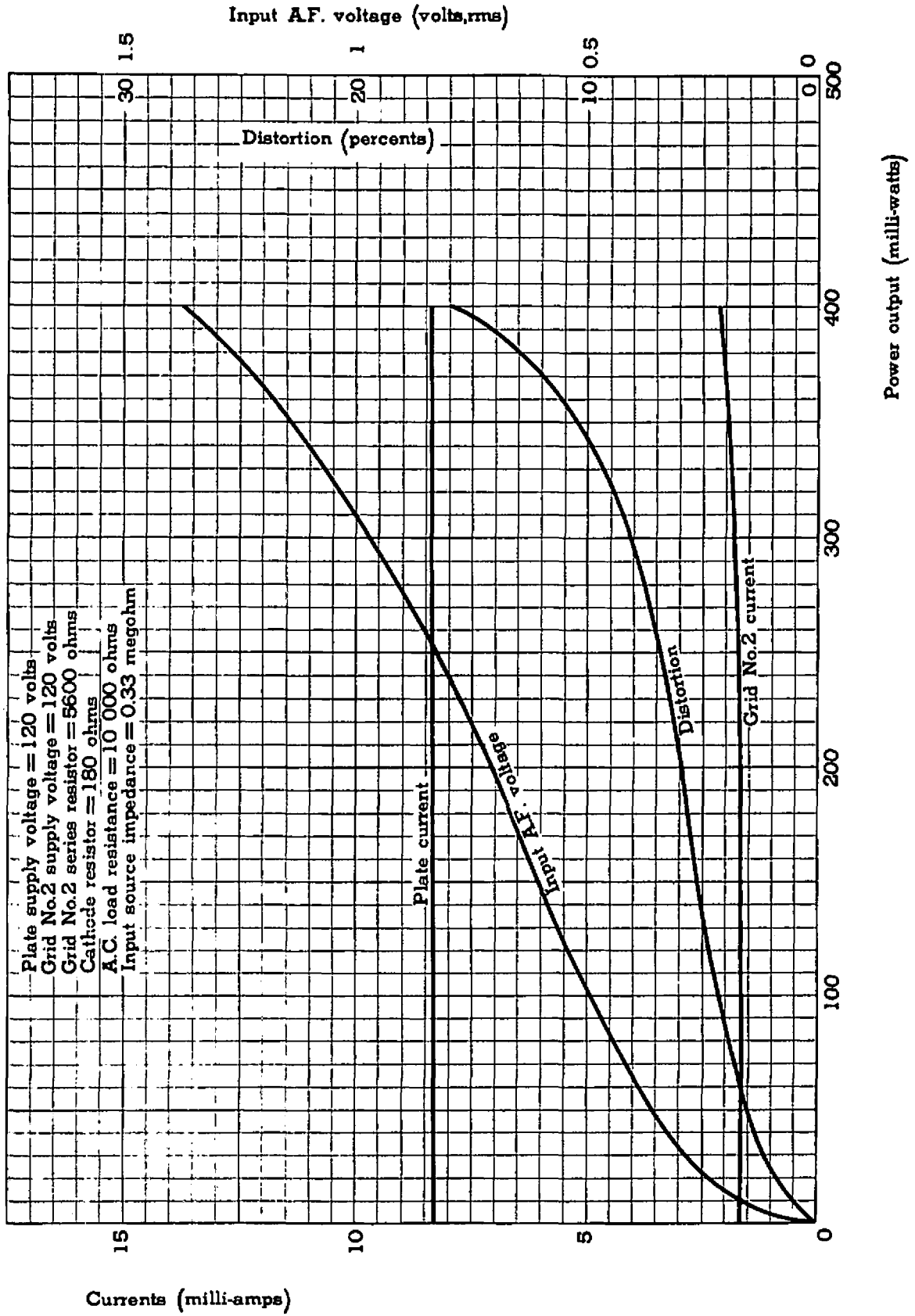
The end point of life of the tube is reached when one or more of the characteristics have changed to the following values:

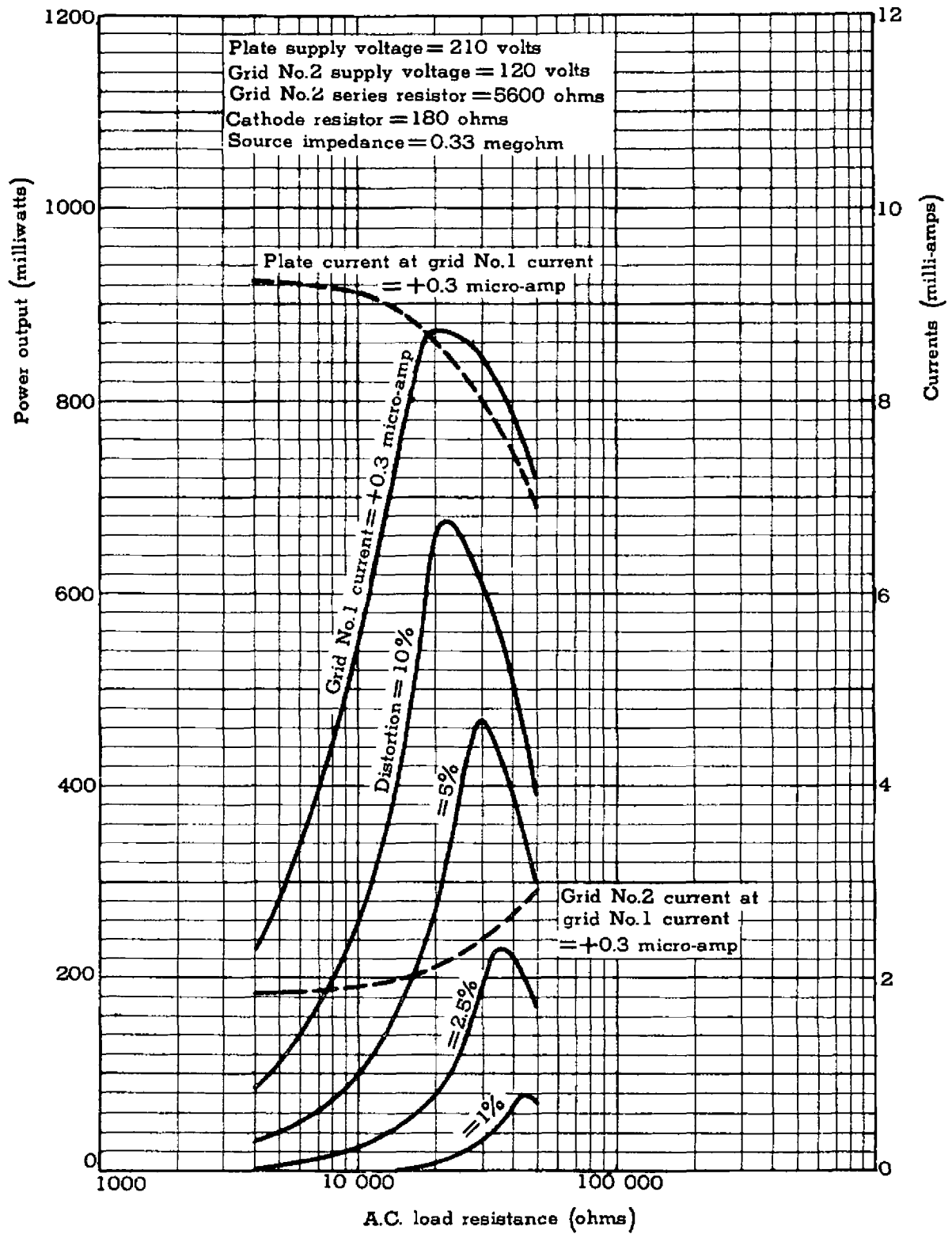
|                                                              |        |                |
|--------------------------------------------------------------|--------|----------------|
| Plate current                                                | $\leq$ | 7.0 mamps      |
| Grid No.2 current                                            | $\leq$ | 1.25 mamp      |
| Transconductance                                             | $\leq$ | 6400 micromhos |
| Negative grid current (grid<br>series resistor = 0.1 megohm) | $\geq$ | 1.0 $\mu$ amp  |

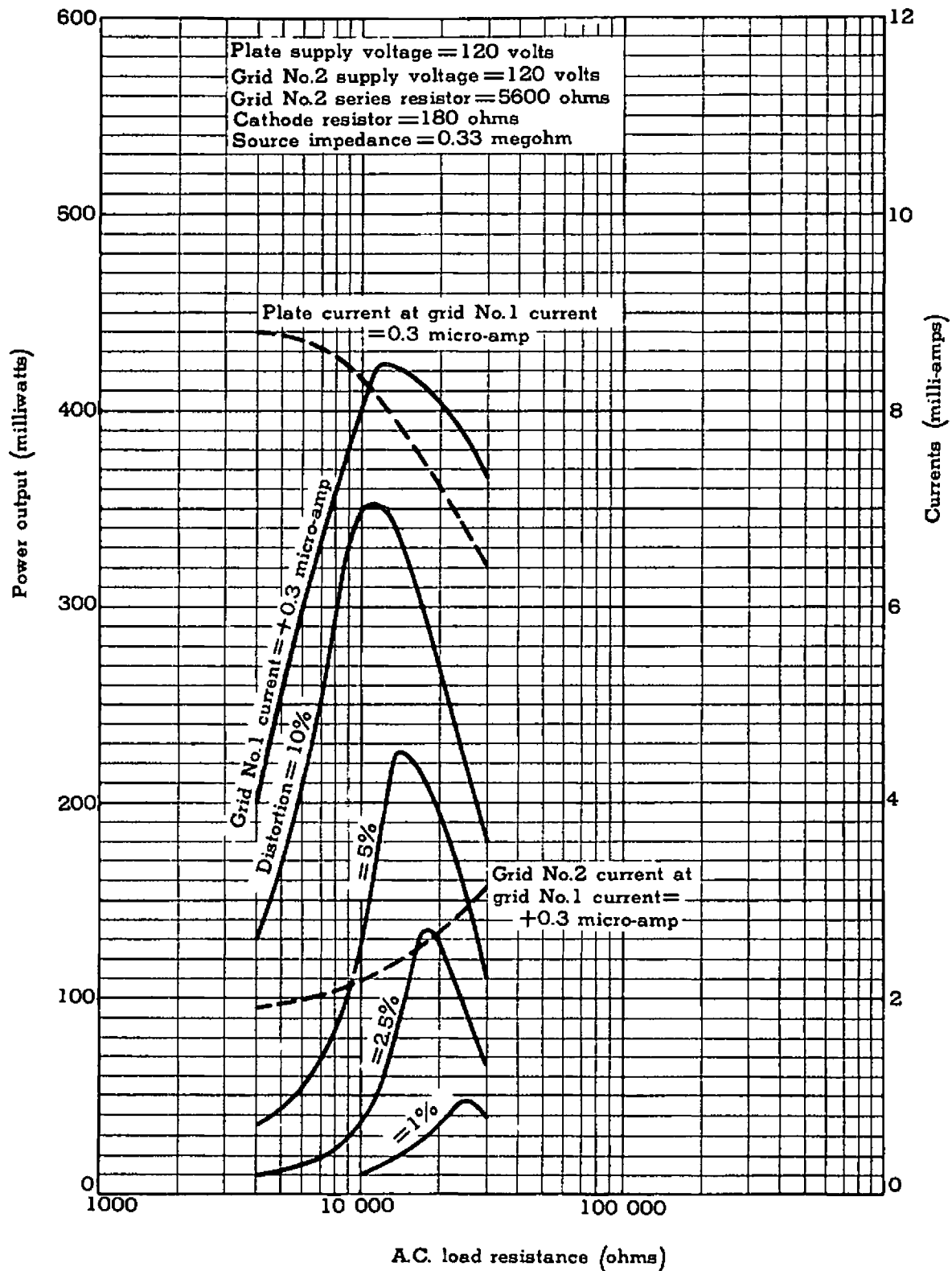


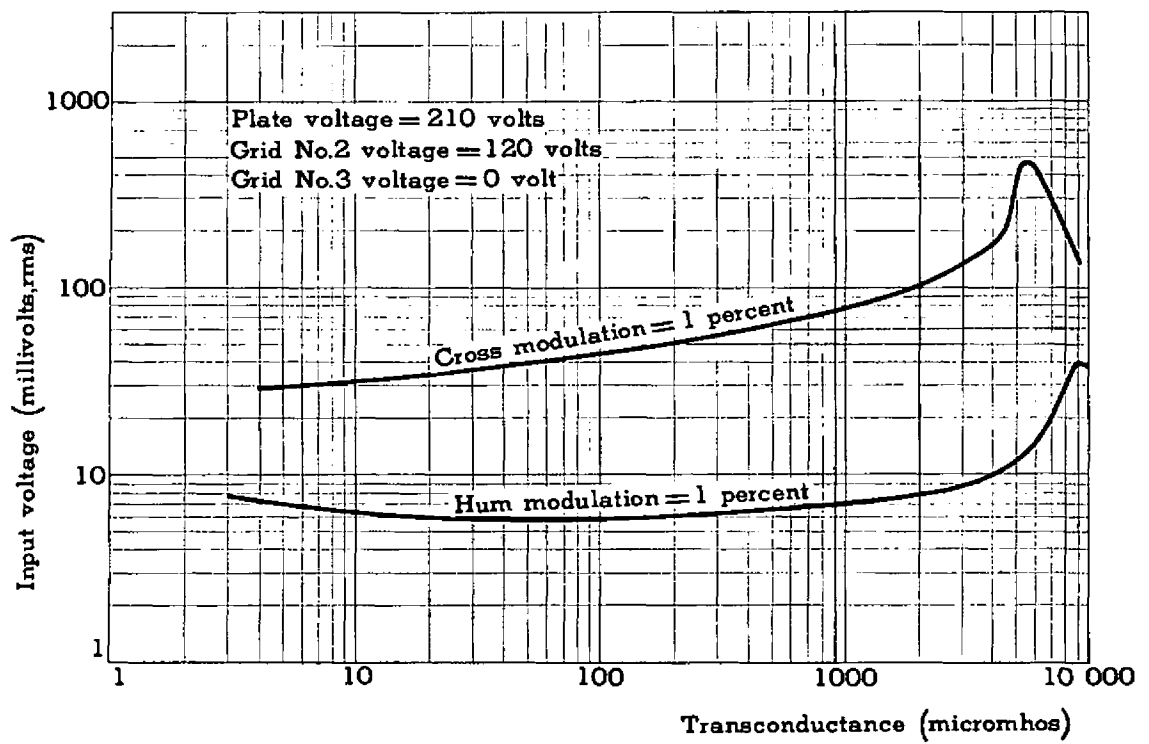


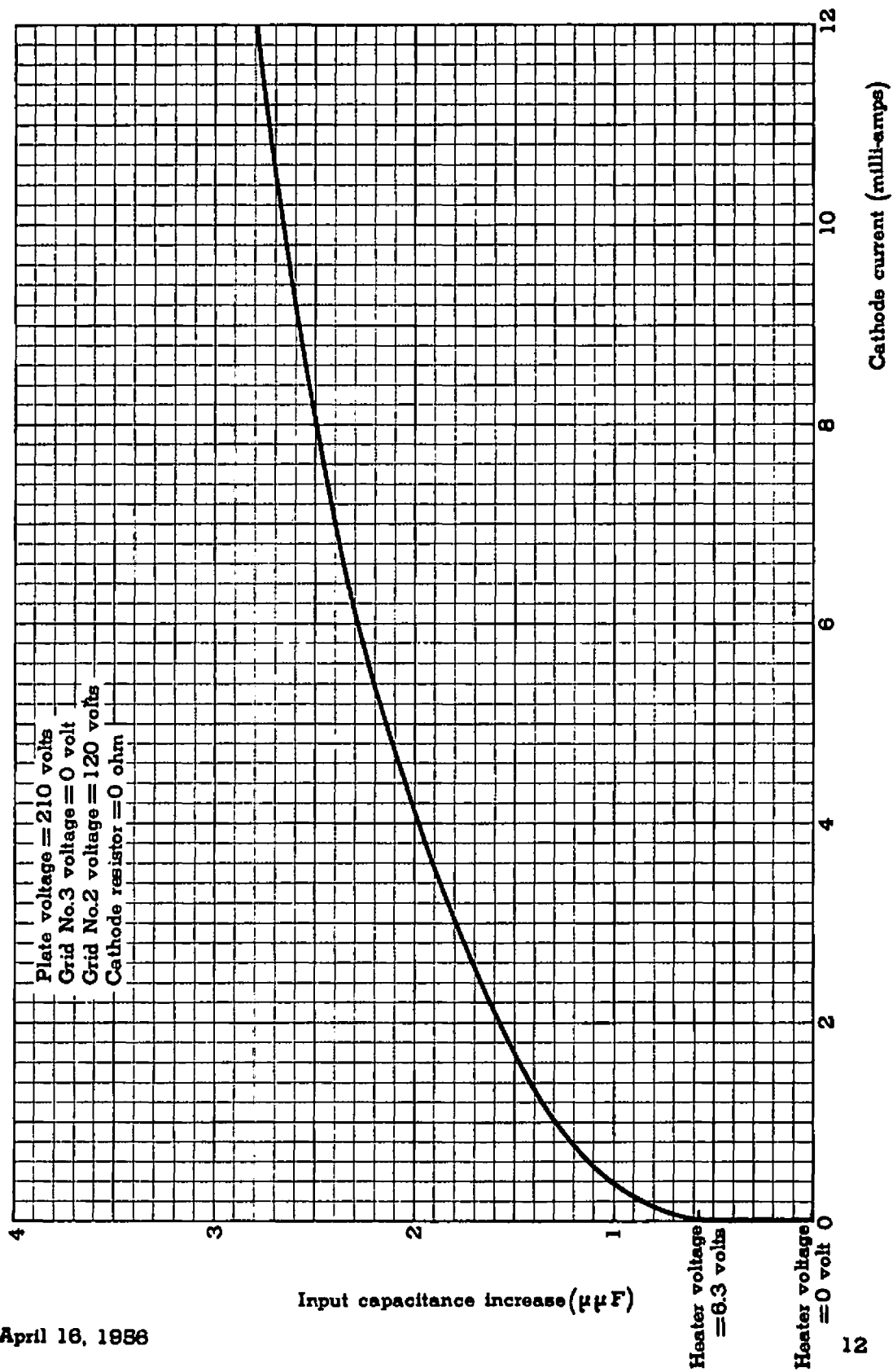












April 16, 1956

