RCA RADIOTRON COMPANY, INC.
HARRISON NEW JERSEY

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Includes revised Figs 1 & 2 per Errata

UNIFIED SALES--ENGINEERING SERVICE
TO
EQUIPMENT MANUFACTURERS

MEADE BRUNET, Manager
HARRISON, NEW JERSEY

APPLICATION NOTE No. 35
February 26, 1934

APPLICATION NOTE
ON
TRIODE OPERATION OF TYPE 42 AND TYPE 2A5 PENTODES

The 42 or the 2A5 when used as a triode in push-pull audio amplifiers gives good power output and low distortion. In this Application Note, operating conditions and performance results are given for these tubes in over-biased push-pull amplifiers having (a) fixed-bias voltage from a battery and (b) self-bias voltage from a cathode resistor. Both driver and output stages use the same tube type connected as a triode.

Optimum performance results for fixed- and self-bias conditions are shown in Figures 1 and 2, respectively. From these curves, it is apparent that the greatest power output is obtained with the fixed-bias condition. This represents the ideal case because the fixed bias from the low-resistance battery employed minimizes degenerative effects. When the grid-bias voltage is taken from the power-supply voltage divider (semi-fixed bias) or from a self-biasing resistor, the power output is reduced for two reasons. These are (1) that the bias-voltage fluctuates due to change in d-c plate current with signal and (2) that the by-passing of the a-c component around the biasing resistor may be inadequate. Ordinarily, the power output will be somewhat less with self-bias, because this arrangement generally has the poorest regulation. Semi-fixed bias will give results between the fixed- and the self-biased arrangements. The curves of Figure 2 show the optimum power output that can be obtained with the self-bias arrangement under the given conditions. In this case, sufficient capacity was used across the cathode resistor to reduce its impedance to a negligible value.

The following Table gives the essential data for triode operation of two 42's or two 2A5's as over-biased push-pull audio amplifiers. This kind of amplifier is identified by us as a Class AB amplifier. Class AB operation is intermediate to Class A and Class B operation.

Table I

Driver tube: Type 42 or Type 2A5; plate volts = 250; grid volts = -20; screen tied to plate.

Output stage: Two Type 42's or Type 2A5's; with no signal input, plate volts = 350 and grid volts = -38.

	Fixed Bias	Self Bias	
Driver Plate Load	24600	25200	Ohms
Interstage Transformer Ratio Primary to ½ Secondary	1.6 to 1	1.14 to 1	
Transformer Efficiency	84.5	65.0	Per Cent
Peak Grid Voltage on Output Tubes (per Grid)	63.5	82.15	Volts
Peak Power Input to Grids of Output Tubes	366	300	Milliwatts
Plate-to-Plate Load	8000	8000	Ohms
Power Output (5% Distortion)	18.4	14.8	Watts
Self-Biasing Resistor	-	730	Ohms

The following Table gives the characteristics of a 42 or a 2A5 for triode operation as a Class A audio amplifier.

Table II

Plate Voltage	250 max.	Volts
Control Grid Voltage	-20	Volts
Plate Current	31	Milliamperes
Mutual Conductance	2300	Micromhos
Plate Resistance	2700	Ohms
Load Resistance	3000	Ohms
Power Output	650	Milliwatts

From Table I, it will be noted that the driver tube is required to supply peak input power of either 366 or 300 milliwatts to the grids of the power tubes. When transformer efficiency is taken into account, the driver must supply 434 and 460 milliwatts peak, or 217 and 230 milliwatts RMS, for the fixed- and self-bias conditions, respectively. These operating requirements are well within the capabilities of either the 2A5 or 42, since either type as a driver is capable of supplying 650 milliwatts (see Table II).

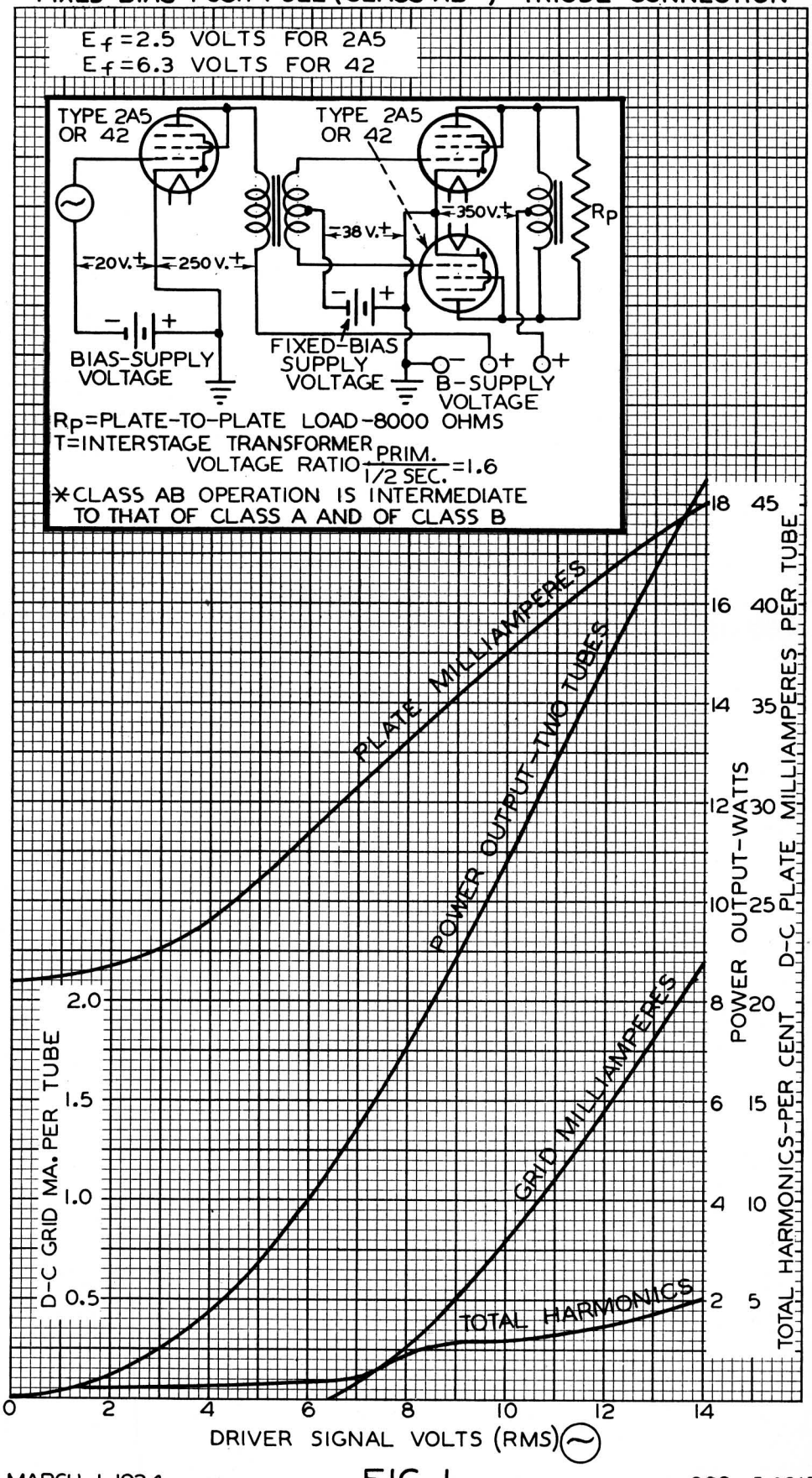
RCA Radiotron

Cunningham RADIO TUBES

RCA-2A5, RCA-42 C-2A5, C-42

OPERATION CHARACTERISTICS

FIXED BIAS PUSH-PULL (CLASS AB*) - TRIODE CONNECTION



MARCH 1, 1934

FIG. 1

925-5461RI

RCA Radiotron — Cunningham RADIO TUBES

RCA-2A5, RCA-42 C-2A5, C-42

OPERATION CHARACTERISTICS

SELF BIAS PUSH-PULL (CLASS AB*) -TRIODE CONNECTION

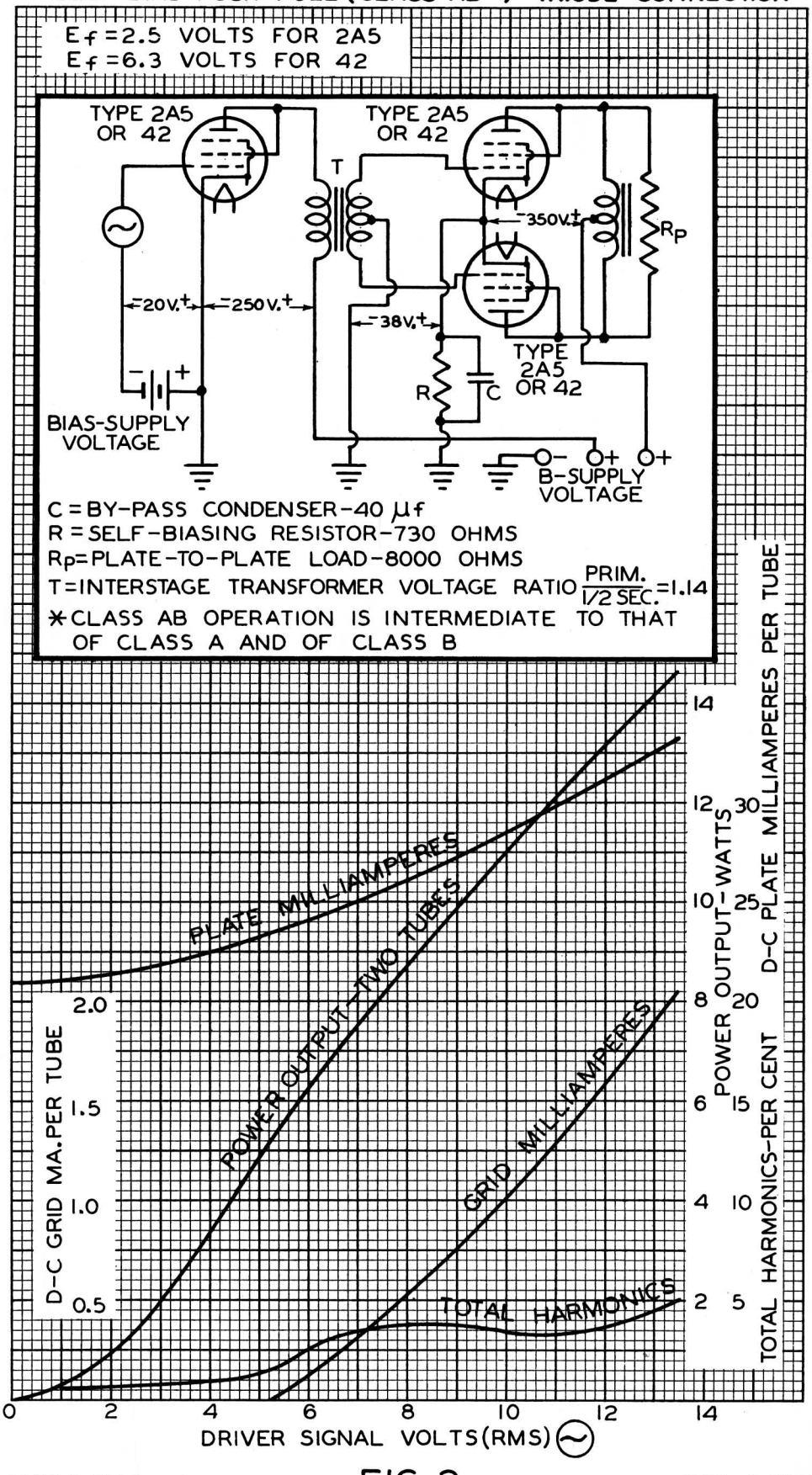


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FIG. 2

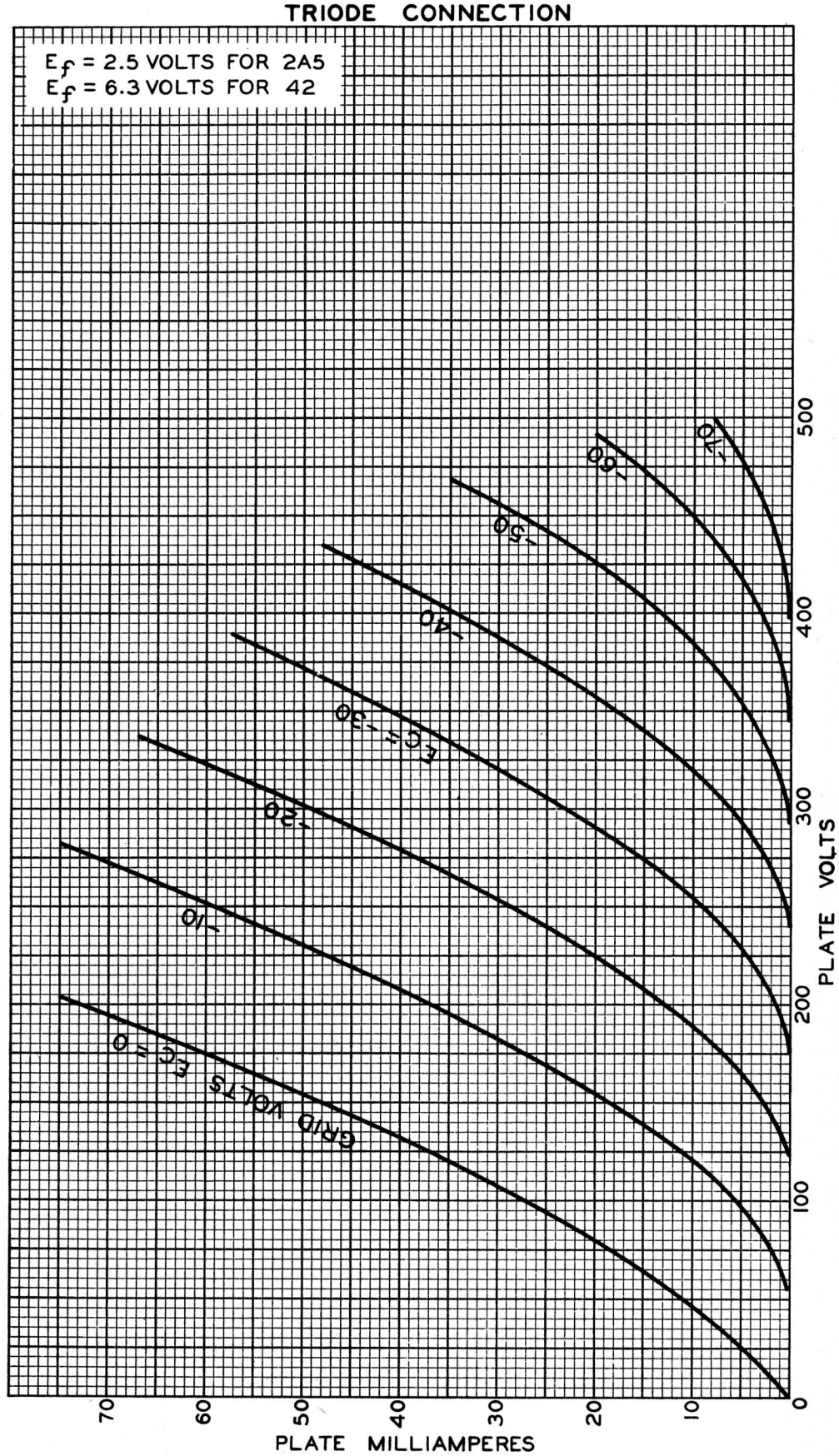
925-5460R1

RCA Radiotron Cunningham RADIO TUBES

RCA-2A5, RCA-42 C-2A5, C-42

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



FEB. 16, 1934

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ERRATA NOTICE ON APPLICATION NOTE No. 35

In Application Note No. 35, "Triode Operation of Type 42 and Type 2A5 Pentodes," the tube symbol used in the diagrams of Fig. 1 (92S-5461) and Fig. 2 (92S-5460) is incorrect. Please replace these pages by the attached Fig. 1 (92S-5461R1) and Fig. 2 (92S-5460R1).