impedance to a pair of these tubes in push-pull is practically constant throughout the region uv, and the distortion resulting from grid-current flow is very small so long as the crest value of the excitation voltage does not exceed up (or pv).

As previously stated, the power required to drive this type of amplifier is somewhat greater than that required by class A_1 amplifiers where the input impedance is extremely high (grid current practically zero). Consequently the driver stage (the amplifier that supplies the excitation voltage) must have sufficient power capacity to handle this higher demand. The driving power necessary for tubes of a given type is usually given in tube handbooks or may be determined from the tube-characteristic curves, and the driver stage must be designed to deliver this power plus any losses in the coupling network.

Class AB Push-pull Amplifier. The class AB amplifier operates with a bias somewhere between that required for class A and that required for class B amplification. Thus it is less subject than the class B amplifier to increased distortion with changes in direct voltage supply, while possessing much of the increased power capacity of the class B, and is probably more widely used for power-amplification purposes than are either class A or class B amplifiers. As in the case of class B amplifiers the grids of the tubes are ordinarily driven somewhat positive to secure the maximum power output.

Determination of Class B and AB Push-pull Amplifier Performance. The performance of class B and AB, push-pull amplifiers may be determined in exactly the same manner as for class A amplifiers.[1] Figure 55.9 shows a set of curves for a pair of tubes operating with a 65-volt negative bias and 250 volts on the plate. The composite curves are drawn in the manner already described in connection with Fig. 51.9, and load lines may be drawn for any desired resistance. The one shown is for 4080 ohms, plate to plate. The performance may be determined in the same manner as for the class A amplifier, but the normal range of operation extends over into the positive grid region.[2]

---

[1] B. J. THOMPSON, Graphical Determination of Performance of Push-pull Audio Amplifiers, *Proc. I.R.E.*, **21**, p. 591, April, 1933.

[2] An excellent method of analyzing class B amplifiers is that given by W. G. Wagener, Simplified Methods for Computing Performance of Transmitting Tubes, *Proc. I.R.E.*, **25**, p. 47, January, 1937.