

Overall view of the 40-watt version of hi-fi amplifier built by author.

40- or 60-Watt Hi-Fi Amplifier with Tertiary Feedback

By THOMAS F. BURROUGHS / Complete construction details on a stable, high-power audio amplifier with output-stage cathode feedback.

FOR years the most popular power amplifier circuit design was based on the famous "Williamson." Some of the factors leading to its popularity are its low distortion, simplicity, straight-forward design, and the rising interest in high-fidelity reproduction. Even today a "Williamson" amplifier that is carefully constructed and tested with the speaker with which it is to be used will give top quality results.

Of late the trend in amplifier design has been toward higher power and, as the trend has developed, use of the "Ultra-Linear" output stage has grown with it. In this circuit the primary winding of the output transformer is tapped at approximately 40 per-cent of the primary turns. These taps are con-

nected to the screens of the output, thus providing the inherent advantages which have been adequately covered in the literature.

Some interest has been shown in tertiary feedback, which has been called "super Ultra-Linear." Up to this time, there have been very few circuits published using this type of feedback, but it is believed that its popularity will grow as more transformers become available. Some of the advantages of tertiary feedback are the lack of problems involving instability—which may occur when feedback is taken around three or four stages. In fact, an amplifier with tertiary feedback seems to be more tolerant of an over-all feedback loop. It is very effective in reducing distortion and helps to lower the internal impedance of the amplifier.

While the distortion of present-day amplifiers is very low when measuring a sine wave, it is only of late that attention has centered on the stability of the amplifier. In a feedback amplifier instability will occur when the feedback becomes regenerative. This regeneration takes place when the phase shift reaches 180 degrees at some point where the gain of the amplifier has not dropped by an amount equal to the feedback. Sometimes instability will appear when a transient signal is fed to the amplifier. This transient instability is one of the reasons why an amplifier often shows up on test in-

stability is very low when measuring a sine wave, it is only of late that attention has centered on the stability of the amplifier. In a feedback amplifier instability will occur when the feedback becomes regenerative. This regeneration takes place when the phase shift reaches 180 degrees at some point where the gain of the amplifier has not dropped by an amount equal to the feedback. Sometimes instability will appear when a transient signal is fed to the amplifier. This transient instability is one of the reasons why an amplifier often shows up on test in-

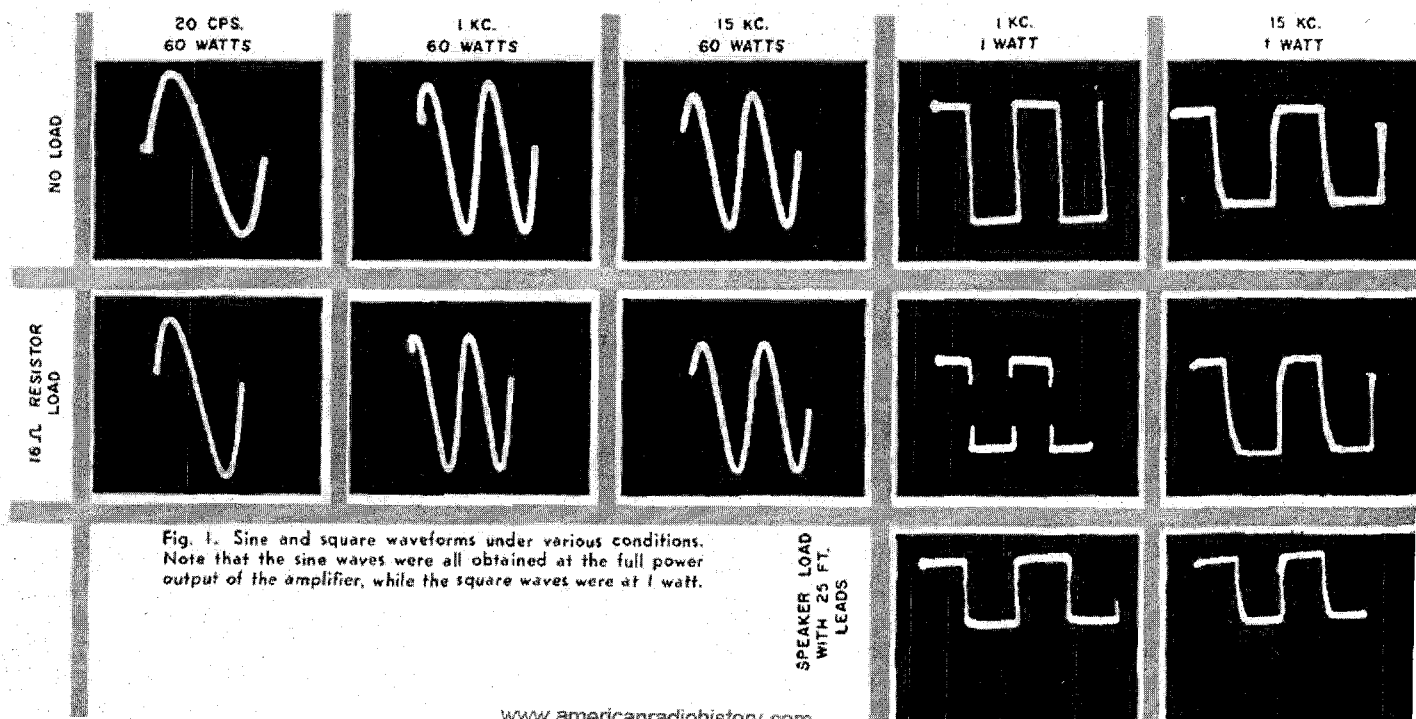


Fig. 1. Sine and square waveforms under various conditions. Note that the sine waves were all obtained at the full power output of the amplifier, while the square waves were at 1 watt.