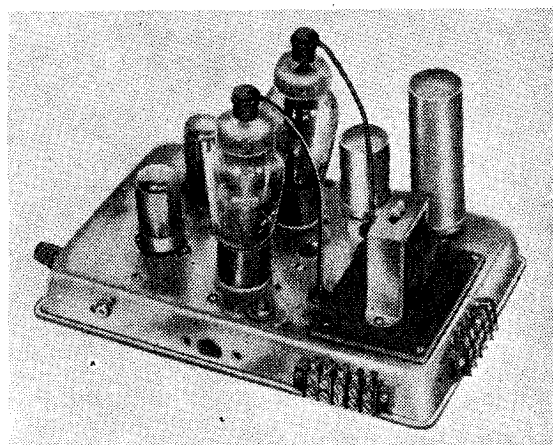


Cascode A.F. Amplifier

"Long-tailed Cascode Pair" as Combined Pre-amplifier and Phase Splitter

By L. B. HEDGE, Ph.D.



Amplifier with "replacement" output transformer.

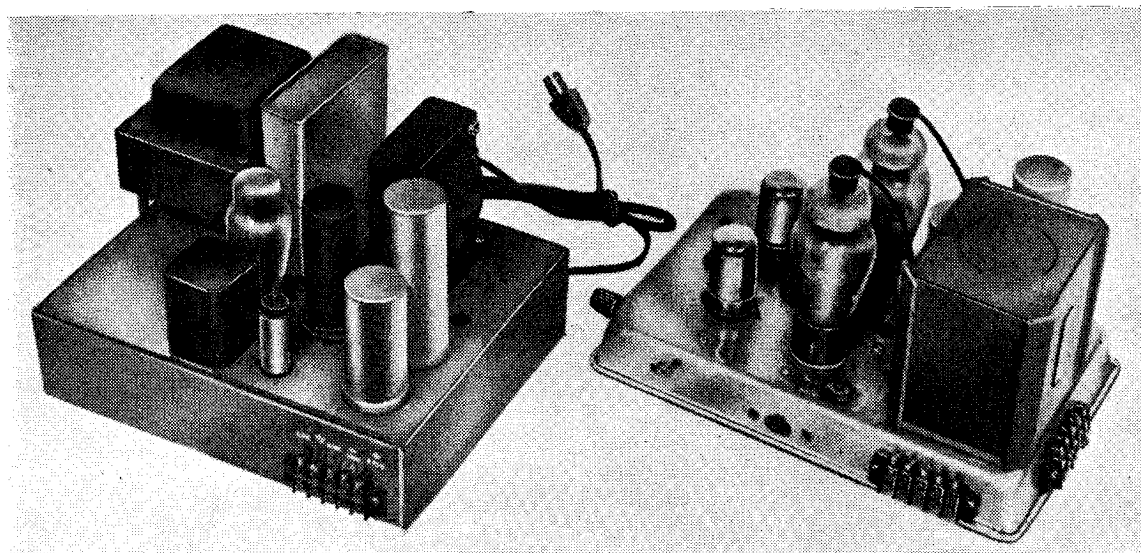
THE "cascode" amplifier—a series connection of two triodes which operates much like a single triode, with characteristics practically unattainable in a single triode—has been extensively employed as a high-frequency amplifier during recent years, and more recently as a first-stage, low-level, audio-frequency amplifier (so-called "pre-amplifier"). Although the cascode was developed as a direct-current amplifier for voltage regulator control application¹, its recent uses have been largely based on the inherently low level of stage noise². The importance of minimizing the signal-to-noise ratio in a variety of high-frequency applications, including radar, television and many others, has served to keep attention focused on this low-noise feature as the distinguishing characteristic of the cascode, and its use in the audio-frequency field has also been based largely on this feature.

The amplifier here described (on which patents are pending) is the result of a return to an earlier view of the cascode stage; it is used here because of the characteristics for which it was originally developed—its triode-like performance and its high equivalent amplification factor. Although low noise is no disadvantage in any amplifier, it is of

importance only in a stage (the first, barring exceptional circuitry) where the input signal is of sufficiently low intensity to make the signal-to-stage-generated-noise ratio critically small. In the next-to-final stage of an audio-frequency power amplifier, only exceptionally bad design could make the noise generated in the stage a factor of significance in the performance of the system.

High quality in audio-frequency power amplifier performance—uniformity of response and low distortion over the spectrum of audible frequencies—depends in large measure on a few closely inter-related design elements; the output transformer, the feedback circuitry, and the frequency, phase-shift, and attenuation characteristics of the inter-stage couplings which establish the limits within which feedback may be used as an overall corrective³. In general the output transformer is the effective limiting element in amplifier performance, and recent impressive improvements have been based on special transformer designs⁴.

In exploring the problem of evolving an amplifier



Complete amplifier and power supply. (UTC LS-55 output transformer.)