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QST Issue: May 2002
Title: Tube Lore: The Famous 813
Author: John H. Dilks III, K2TQN

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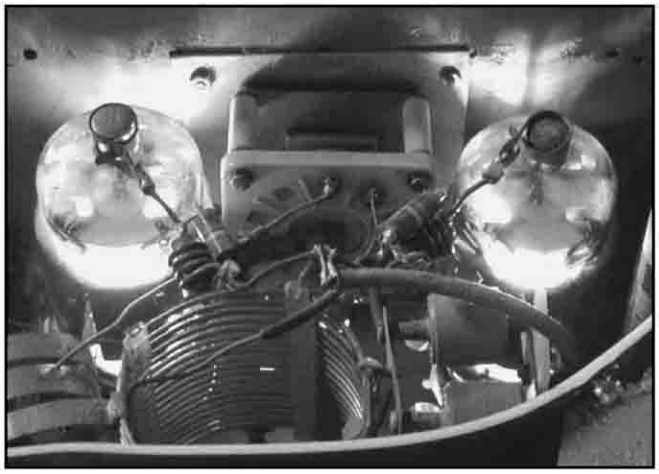
Tube Lore

Tube collecting is really catching on. One popular tube that hams have used and collected for years is the 813. I've asked Ludwell Sibley, KB2EVN, tube expert and well-known author to write about it this month.



BOB DUCKWORTH, WB4MNF

Figure 1—Kilowatt homebrew HF 813 amplifier, 80-10.

The Famous 813

The 813 transmitting beam power tube served in amateur transmitters over a remarkably long time span. Introduced by RCA in November 1938, it was a "big brother" to other beam tubes like the 6L6 and 807 (1936) and the 814 (1938).

It offered several design innovations: a "giant" seven-pin base, a rugged hard-glass bulb, a zirconium-coated graphite anode, and especially "button-stem" construction. In this construction, thick tungsten leads were sealed individually into a glass "dish" base. The 813 seems to have been the first tube to enjoy this construction, which enhanced VHF tubes like the 815, 826, 829B, and 832A. The result was quite a compact tube for its power rating, able to take full power up to 30 MHz. Its short element leads were always welcome. The screen grid was aligned with the control grid so as to draw minimum screen current.

This was a powerful tube, good for 100 W dissipation in commercial use and 125 W in intermittent/amateur service. A pair of 813s would "officially" handle 800, 900 or even 1000 W input in ham use.

Most triode-based final amplifiers had to use neutralization to balance out the grid-to-plate capacitance and assure stable operation. RCA claimed that, with its internal shields and tetrode construction, the 813 didn't need neutralization. The circuit designs in their early construction literature were unneutralized, although many 813-based transmitters in the *ARRL Radio Amateur's Handbook* did employ it.

The 813 enjoyed heavy use in commercial and military HF transmitters in WW II, as in ground-to-air or shipboard service. Renamed VT-144, it acted as driver or final amplifier in the Signal Corps BC-303, BC-339 and BC-401. The Navy used it in the TCK and several other transmitters, and as the pulse modulator in the SJ radar on submarines. Perhaps its most famous application was in the AN/ART-13 transmitter, "standard equipment" in PB4Y and B-29 bombers.

The 813 was more of a communications tube than a broadcast type. Only the Amperex version was listed on the FCC's 1949 list of broadcast-approved tubes, for transmitters up to 125 W output. The 833 and 833A triodes, from 1939-40, were better suited to the 500-W and 1-kW broadcast market.

A wide spectrum of tube makers besides RCA offered the 813, among them Amalgamated Wireless Valve (Australia), Amperex, Canadian Marconi, General Electric, General Electronics, Ken-Rad, Machlett Labs, North American Philips, National Union, Raytheon, Sylvania, Taylor, United Electronics, and Westinghouse. The Soviet tube industry in later years made a tube remarkably similar to the 813.

RCA promoted its tube in the amateur world, including a transmitter design advertised in 1939 with a single 813 as 150-W crystal oscillator (crystals were more robust then!). However, the tube didn't really get big amateur use until the postwar era—in part because its list price fell from $22 (1941) to $14.50 (1946). At that point, the availability of inexpensive ex-military tubes and the need to prevent television interference led to considerable use. The 813 had the advantage of much higher power gain than triodes, needing only 1 W of drive for 250 W output. In a TVI environment, low drive power (and low radiated harmonic energy) became an important advantage. The *Handbook* from 1948 to 1968 consistently included one or two transmitter designs using an 813 or a pair of them. Twenty years is a remarkably long time span for any tube!

813s are still widely available and remain popular in the "boatanchor" community.—*KB2EVN*

Ludwell Sibley, KB2EVN

His book, *Tube Lore*, published in 1996 is intended to aid the present-day user and collector of electron tubes by providing historical insight and specific technical data. Sibley has just released Supplement 3 to his book. He can be reached at **tubelore@internetcds.com** for more information. In addition to his book, he has written many articles for radio publications and was Editor of the AWA *Old Timer's Bulletin* for several years. He is a collector of telegraph, radio and early technical publications.

Tube Collectors Association

KB2EVN also edits the *Tube Collector* bulletin of the Tube Collectors Association, now in its fourth year. This group maintains a Web site at, **www.tubecollectors.org**. They welcome new members and can be reached by mail at: PO Box 1181, Medford, OR 97501. QST

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