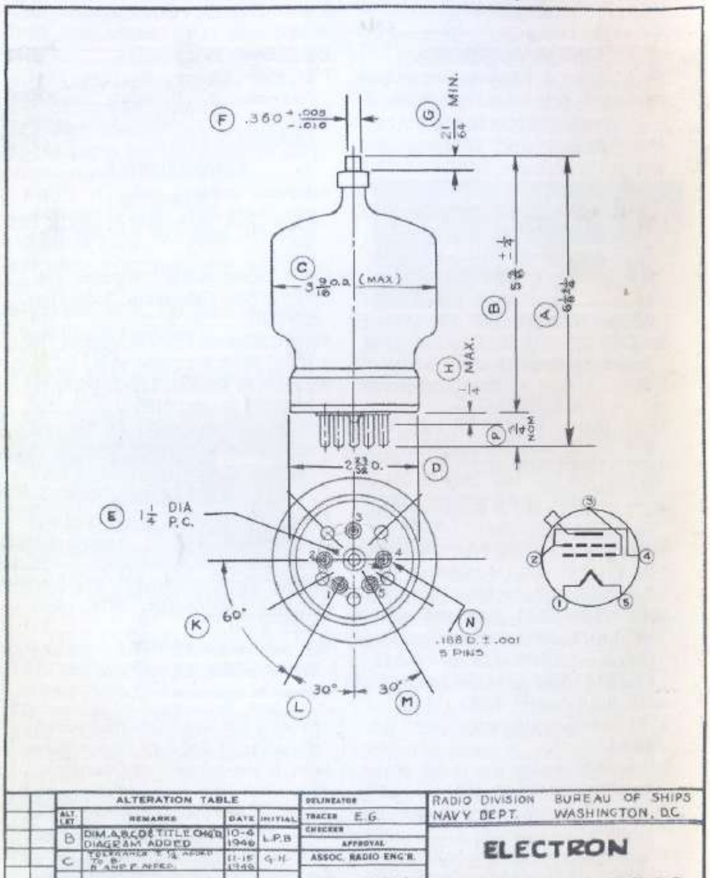
Eimac applied for registration of the 4-250A with the Radio Manufacturers Association. The latter assigned the identifier 5D22 early on, although final registration wasn't complete until late 1946. The Navy showed early interest in the new tube. The Bureau of Ships drawing below is in a format dating back to the days of George Clark as Expert Radio Aide at the Washington Navy Yard in WW I.

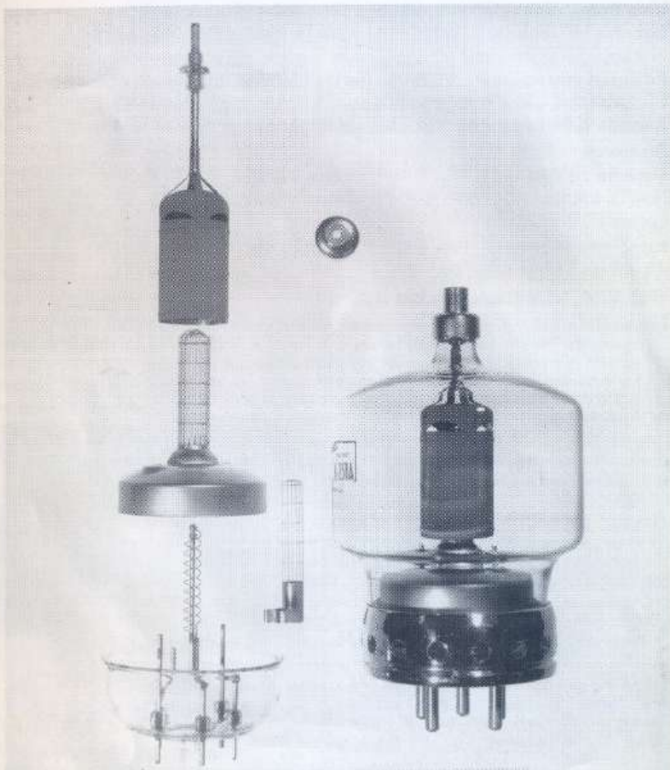


TUBE COLLECTOR

TUBE COLLECTORS ASSOCIATION

"HISTORY • PRESERVATION • APPLICATION"

Vol. 9 No. 6 December, 2007



TUBE COLLECTOR

TUBE COLLECTORS ASSOCIATION, INC.

PO Box 636, Ashland, OR 97520, USA

The Tube Collectors Association is a nonprofit, noncommercial, international group of individuals active in the history, preservation, and use of electron-tube technology. *Tube Collector*, its bulletin, appears six times per year.

To join TCA: annual dues is $20.00 in North America ($25.00 elsewhere), to the address above. Please make checks payable to "Tube Collectors Association." Payment by PayPal is also welcome, to *tca@jkasystems.com*. The membership year runs January-through-December. Those joining after February receive the year's back issues of *Tube Collector*. Multi-year memberships are offered: in North America, $38 for two years or $56 for three; elsewhere, $49 for two years or $73 for three.

Articles on tube topics are invited. Editorial correspondence should go to the editor at *tubelore@jeffnet.org* or **102 McDonough Rd., Gold Hill, OR 97525**.

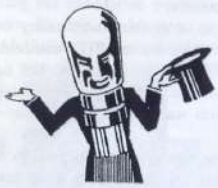
Changes of address and other membership traffic should go to Bob Deuel at *tca@jkasystems.com* or **PO Box 636, Ashland, OR 97520**.

FRONT COVER: The Eitel-McCullough 4-250A tetrode as of 1948.

REAR COVER: A Navy view of the 4-250A (registered identifier: 5D22) from 1944. These illustrations go with the 4-250A notes in this issue.

Graphics: History San Jose

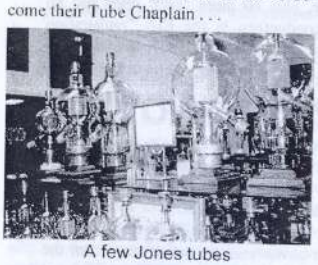
MICROPHONICS FROM THE EDITOR



JONES TUBES GO ON DISPLAY

Our roving reporter Jerry Vanicek has just visited the American Museum of Radio and Electricity in Bellingham, Washington. He reports that large portions of the Al Jones tube collection, donated a couple of years ago, are now on display on attractive shelving. There is much more work to do, but is a great pleasure to see this resource become visible to the public. The museum is open Wednesdays through Saturday, 11 AM - 4 PM. More details are available at www.amre.us.

Jerry reports that the museum could use some consulting assistance from a tube-savvy person in western Washington or northern Oregon. Here's a chance to become their Tube Chaplain . . .



A few Jones tubes

VTV INDEX AVAILABLE

A fair number of TCA members are familiar with *Vacuum Tube Valley*, the tube-audio journal that appeared in 20 editions between 1995 and 2003. There's a lot of classic tube-related material in those issues. To turn a random stack of magazines into a research source, an index, organized by topic and by author, is now available from your friendly TCA editor. It's seven pages in 8-½" x 11" format. To obtain a copy, U. S. readers may send a self-addressed business-size envelope with 41¢ stamp to the Gold Hill address. Foreign members may contact said editor at tubelore@jeffnet.org and we can work something out.

REVIEW: A Brief History of Bendix Red Bank Tubes

By Charles Hansen

80 pp., 8-½" x 11" soft-cover format, published by Audio Amateur Press, available from Old Colony Sound Lab, PO Box 876, Peterborough, NH 03458 (www.audioexpress.com) for $24.95 plus $9.05 shipping and handling; also from Antique Electronic Supply (www.tubesandmore.com).

The Bendix Aviation Corporation had a division in New Jersey that made a wondrous line of small tubes. The ones that are glamorous today are the conventional types

IN THIS ISSUE

ing speed suitable for the instrument's wider bandwidth, a more complex screen (or "target") structure designated Type 202, and consisting of closely-spaced hexagonal dots of P1 phosphor, was used. This left exposed conductive areas surrounding the dots, which aided collection of secondary electrons and resulted in about ten times the stored writing speed of the T5640-201. Unfortunately, the T5490-202 lacked the high brightness of the original 540 series in the conventional operating mode. This was due to several factors. The accelerating voltage was only 4 kV, compared to 10 kV; the screen could not be aluminized; the P1 phosphor was not as bright as P31; the exposed collector area decreased the screen area covered by phosphor and contributed no light; and MgO added to the phosphor for improved writing speed further decreased light produced by the phosphor. The phosphor layer may also have been thinner than used for conventional screens that had thicknesses optimized for brightness. An external illuminated graticule was used, since it would have been very difficult to add it to the already complex screen structure. No optional phosphor types were ever available as options since it was the unique secondary-emission properties of P1 that made the simplified storage CRT work in the first place.

T4540

The 454 was merely a 453 with the vertical bandwidth extended to 150 MHz in keeping with the trend towards ever-increasing needs for higher frequency design work. The 453 debuted in 1967.

The T4540 CRT (Figure 5) differed from the previous T4530 primarily in its use of a distributed vertical deflection-plate system in order to achieve 150 MHz bandwidth with good deflection sensitivity. The same phosphors were available as in the T4530.

Fig. 5. T4530

TYPE	P1	P2	P7	P11	P31
T4220 Early	154-0466-01	154-0466-02	154-0466-03	154-0466-04	154-0466-00
T4220 Later	154-0466-06	154-0466-07	154-0466-08	154-0466-09	154-0466-05
T4530	154-0492-00	154-0492-01	154-0492-00	154-0492-00	154-0492-00
T4540	154-0505-01	154-0505-02	154-0505-03	154-0505-04	154-0505-00
T6470 Early					154-0424-00
T6470 Late				154-0434-00	154-0448-00

Table 1. CRT Part Numbers

CREDITS

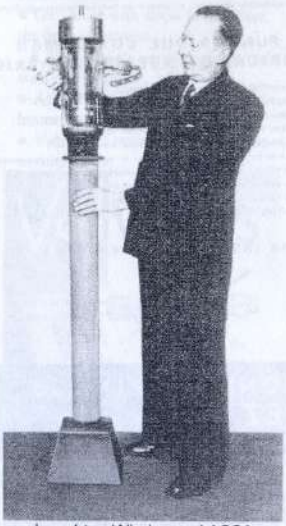
I would like to acknowledge the many CRT design engineers, scientists and others at Tektronix who made possible the significant advances discussed in these articles. The author worked with many of them from 1963 on. Any omissions are due to faulty memory caused by forty to fifty years of elapsed time. These "Tekies" include:

Continued on p. 30

MR. LAUGHTON WINDUS AND THE ART OF VALVE RECONSTRUCTION

Abel Santoro

Born on the Isle of Man, England, on May 9, 1888, Mr. Laughton Windus came with his parents to Argentina in 1905, at the age of 17. The family intended to establish a farm in Juarez County, in Buenos Aires province. Some years later, he reached the grade of electronic engineer, specializing in valve technology. He began working in a small laboratory named "Ultravac" at 3845 Sarmiento St. in Buenos Aires town, making neon signs and mercury rectifiers. Some years later, Ultravac moved to 2601 Alcorta Ave., changing its name to "ASSA Ltd." At this new site of 20,000 square meters were made neon signs, fluorescent lamps, numerous valve types and X-ray tubes. Many types of power valves were rebuilt here as well. ASSA Ltd. had some thousand



Laughton Windus and ASSA rebuilt valve from 1941

workers in this factory, of whom three notable people were Mr. Enrique Windus, son of Laughton; Mr. Domingo Cortese; and Mr. López.

Mr. Enrique Windus, born in Argentina on May 14, 1924, began working at ASSA Ltd. with his father in valve assembly, when he was still a boy. Mr. Domingo Cortese was an electronic technician, expert in glass-blowing and in high-vacuum techniques, and Mr. López, was a glass-blower.

Enrique Windus at home

The most important section inside the factory comprised the four big high-vacuum furnaces working day and night, pumping-down the big power valves, which required a lot of hours on the pumps to reach a good high vacuum.

Domingo Cortese at neon-sign bench

Around the year 1945 and parallel with ASSA Ltd., Mr. Laughton Windus, in association with Mr. López, established a new laboratory for valve reconstruction, named "Windus, López & Company," situated at 5499 Costa Rica St., in Buenos Aires town. In this laboratory several types of valves were repaired. In an advertisement appearing

Windus ad - see text for translation. Note the logo based on the outline of an 849 tube. The tubes on offer reflect a remarkable range of origins: clockwise from bottom, an (unidentified) 1738-A, WE 222A, Telefunken RS207, Marconi CAT6, Philips TA12/20 and TA18/100, STC 4010A, Telefunken RS255, Federal F-124A, and Marconi MT9F.

in a magazine of 1945 (see below) one reads the following:

"All these valves and many more can be repaired in our laboratory, transmitting and rectifier valves of all brands and types, including water-cooled types, can be reconstructed completely, the worn or deteriorated parts are repaired or replaced; the original characteristics are restored. This precision task is done by selected technicians, assuring perfect functioning.

Ten points confirm the security of our work:

• Capable personnel with great experience.
• Absolute cleanliness of the process.
• Internal parts with any wear are renovated.
• Filaments are adjusted to original value.
• Degassing process by electron bombardment.
• On valves with stress in the glass, the bulb is restored
. • Near-perfect vacuum, measured with ion gauges.
• All valves are warranted for 2000 hours."
• Valves are tested with larger than normal loads.
• Minimum aging of 48 hours.

"An Argentine industry with Argentine personnel, and capital also Argentine."

It is said that Mr. Laughton Windus, ran the two companies, ASSA Ltd. and Windus, López & Company very well. These companies were closed down in the mid-'50s.

Today Mr. Enrique Windus (83) is retired and living in his home with his wife, in Buenos Aires town. On the other hand, Mr. Domingo Cortese (84), is the proprietor of a large factory of neon signs and special lamps in San Isidro county, Buenos Aires.

ACKNOWLEDGEMENTS:

Mr. Enrique Windus
Mr. Domingo Cortese
Revista Telegráfica Electrónica, Editorial Arbó, Buenos Aires.

An 869S made new by ASSA

An 892 rebuilt by ASSA