

FROM "WHATZIT" TO " e/m TUBE"

Ludwell Sibley, from inputs from Charles Combs and Jim McConville

Back in January, our member Charles Combs - a previous source of interesting tube mysteries - came up with photos of another one. This time, it's a piece of Central Scientific Co. apparatus with an odd tube. The tube is on a baseboard with what appear to be a pair of Helmholtz coils - series-connected solenoids sized and placed so as to give a uniform parallel magnetic field in the space between them. The tube has a coated target at the top, in an oversized (T16) bulb.

Now, I had previously come across the manufacturing specs for just such a tube in the Dowd-RCA archive. With the unusual developmental number 1037 (not "A-xxx," "R-xxx," or the like), it had been designed in 1940-41. It was "recalled" (abandoned) late in 1941, possibly after failing to win on a contract bid, rather than becoming a commercial product with a 16xx number. It was a puzzler: it was obviously some sort of indicator, but the top of the target anode is coated with "Prep 33-W-3" (the fluorescent stuff used in eye tubes) while the electron gun is below the target. The specs say how to *make* the tube, not how to *apply* it. In particular, there's no hint of the use of a magnetic field, but there is a 5-mm hole in the center of the target. The target

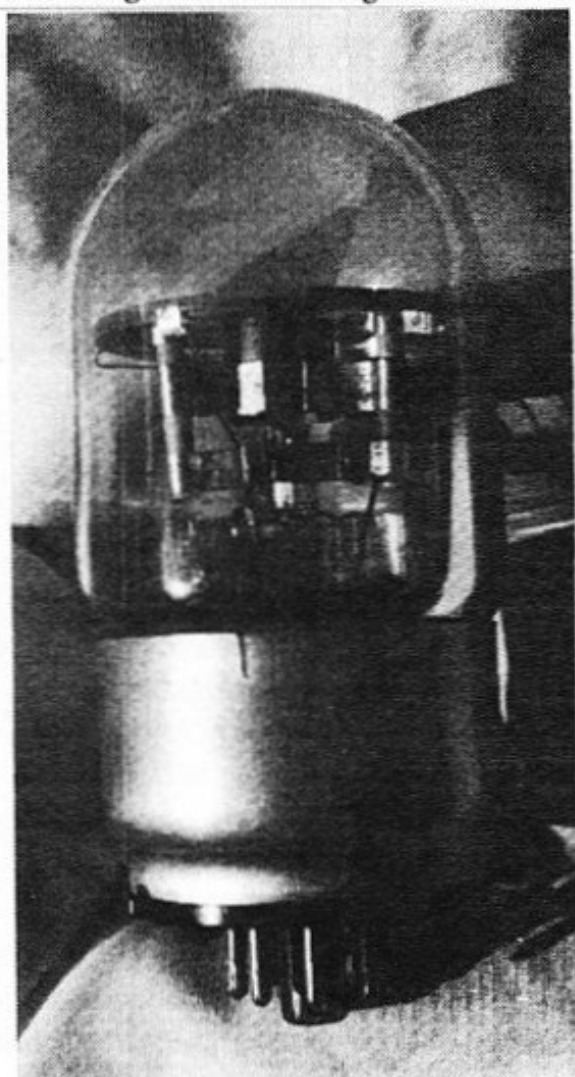
has scale rings of radius 0.5, 1.0, 1.5, and 2.0 cm.

The "Cenco" nature of the device hinted that the rig might be intended as a lab device for physics students to measure e/m , the ratio of charge to mass for the electron. I tried this on our member Jim McConville, who had had lots of experience with electronic lab apparatus and who had previously identified another, much different e/m tube. Bingo! Jim came up with 1950 and 2002 catalog pages from Cenco showing the setup - and with another tube.

So it works like this. The tube has a heater (believed to take 6.3 volts) and cathode. These are inside a focusing grid, a vertical cylinder with a tiny hole in a disk that closes off its upper end. Thus, with 100-200 volts on the target anode, electrons shoot straight up through the hole in the grid and the larger hole in the



The complete setup



The tube, Combs model



1950 Cenco catalog illustration

target. In the magnetic field, the electron beam is deflected down 180° and hits the anode, giving a glowing spot. Knowing the voltage, the magnet parameters (diameter, number of turns, and current), and the radius represented by the spot position, the student can calculate e/m .

As an extra touch, the RCA tube contained argon gas at a pressure of 10 microns of mercury (about a fifth the pressure used in VR tubes). The path of the electron beam became visible as a glowing half-circle at the top of the bulb. Jim noted: "One major difference between the tubes from RCA and the later tubes from Cenco was the fill gas. Apparently argon was not sexy enough, so early on the tube builder used a little bit of Hg to make the beam much more visible. The Hg atoms, upon collision, could become ions and be sent to the cathode where they would do severe damage in short order. Many people asked to have the Hg replaced with other gases, but to no avail. I recall lifetimes on the order of twenty hours."

There are differences in construction. The RCA tube used glass beads to support the grid cylinder. The Combs example, and McConville's sample, use ceramic rods. The RCA tube, and the Combs one, use stem-press construction,

while the McConville tube has been modernized to a button-stem design with 14 support/lead wires sealed into the button (not all of them used). RCA's base is an octal wafer on a metal shell; the Combs tube has the swaged aluminum base that's familiar from the 815; while the McConville sample has a plain bakelite base. The latter is etched "C E N C O / CAT NO. 71266" on the side of the bulb but with no further identification.

Combs observed that there was some fogging at the top of the bulb. The McConville example is also lightly clouded, possibly with target coating that has been evaporated.

Jim offered some further comment: "I had never seen evidence that RCA was involved, I saw the tube about 1960 when it was supplied by Cenco Scientific in Chicago. The manufacturer was never stated. The tubes disappeared from the market for about ten years and then surfaced in a very crude form for enormous sums. I could never ascertain the source."

If anyone has one of these tubes and wants to try it out, the pinout is Pin 2, heater; Pin 3, grid; Pin 4, anode; Pin 8, heater and cathode.

Just for fun, here's the RCA exhaust schedule for the 1037:

1. Exhaust.
2. Bake at 450°C for 1 hour.
3. Activate cathode [*with following heater currents*]: 1 amp for 2 min.; 2 amp for 2 min., 3 amp until pressure is < 0.2 micron.
4. Flash getter 3.5-4.0 amps.
5. Allow about 5 min. for tubes to cool.
6. Put in 10 microns of gas.

Cenco's prices for the apparatus in 1950 were: magnet base and tube, \$85; tube, \$26. The 2002 price, for a modernized magnet base and tube, is \$1226; tube, \$723. In either case external power supplies were/are required.